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Modern Science and Christian Beliefs

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PREFACE

THIS book is an attempt to discuss the relation of modern science to the Christian Faith. I am only too well aware that the treatment of many profound questions raised in this book is open to the just criticism of superficiality and lack of philosophical precision or depth. To write a book which dealt with so many issues carefully, philosophically and thoroughly, in a manner satisfying to the professional student or expert, would necessitate a very large volume indeed. It would also require far greater knowledge and skill, both in science and in philosophy, than I possess. Yet it seems to me that there is some use in sketching out the field, even in an amateurish manner, and drawing at least preliminary attention to the variety of issues which arise. A marked tendency appears today to such an excessive and rigid specialization that no one dares to discuss the general aspects of a great subject over a wide field, for fear of being convicted of ignorance or error in the specialized details of a particular part of it. Moreover there is a place for a discussion of important questions for the amateur non-philosopher, even though such treatment may outrage the philosophical or scientific expert. Such a simple, general and preliminary treatment is all that is attempted here, and I am at least aware how many philosophical questions are ignored or brushed aside. But I trust that the book may give some general indication of the questions at issue, and of my own faith. I hope to show that science and Christianity need never be in hostility or conflict, even though inevitably the advances of science, and even the scientific discipline, method and manner of thought, do raise urgent problems for religion, which must be frequently and fearlessly discussed.

Having spent some seven years in scientific work in the laboratories of the Imperial College of Science and

Technology, London, and four years in the study of Christian Theology in the Universities of Oxford and Cambridge (and in a more practical sense in several parishes and schools), I am naturally keenly concerned with the good relationships of Christians and scientists. If this modest book can do anything at all to advance such good relationships and mutual understanding, it will have served its purpose.

It will be noted that in the course of the book there are many references to and quotations from works of contemporary writers on various aspects of the subject. The unusual number and extent of these quotations is deliberate: it is hoped that in this way the book may serve partly as an annotated bibliography to some of the most important modern works in this field. One of the reasons which has impelled me to attempt a general survey has been the fact that there are so many excellent books dealing with some part or aspect of the subject, but few which attempt to sketch out the whole area.

I wish to acknowledge with deep gratitude the kindness of the authors and publishers from whose books direct quotations have been made, and for which permission has graciously been given; they are referred to in the text and footnotes. In particular I would acknowledge the great help I have obtained in Part I from the works of Mr. M. B. Foster and Professor John Baillie; in Part II, Chapter III, from the work of the Reverend R. S. Lee; and in Appendix C from the Reverend Canon R. R. Bailey.

Especially I would express my profound gratitude to my old friend Dr. Eric Ashby, D.Sc., President and Vice-Chancellor of the Queen's University, Belfast, and formerly Professor of Botany in the University of Manchester, for reading the proofs of this book; to Professor W. David Evans, Professor of Geology in the University of Nottingham, for reading the MS of the whole book; to the Reverend Professor R. H. Fuller, of St. David's College, Lampeter, for reading Appendix D; to the Reverend Canon R. R. Bailey, Ph.D., for reading Appendices A, B and C; and to the Reverend Canon E. W. Heaton for help and advice. All of these

made most valuable suggestions, but they are in no way responsible for any errors that remain. I would also record my very grateful thanks to Mr. F. H. Stevens, then Headmaster of Poole Grammar School, who read the whole MS and gave much help and encouragement; and to Mr. H. A. S. Blankley, my cousin, who performed a like service. Finally, I wish to thank Mr. Mackenzie Wood, of Messrs. James Nisbet & Co. Ltd., for much valuable service, and Miss D. H. Statham for typing the MS and helping in many other ways.

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NOTE: Several notable books—Dr. Mary Hesse's *Science and the Human Imagination*, Dr. J. R. Oppenheimer's *Science and the Common Understanding*, Professor C. A. Coulson's *Science and Religion: a changing Relationship*, and particularly his *Science and Christian Belief*—have unfortunately been published too recently for me to take account of them in this edition.

Above all, the Bampton Lectures for 1956, *Christian Theology and Natural Science*, by E. L. Mascall, were only published after the English edition of this book had been published. This is much the best and most thorough discussion of the relations of Christianity and modern science, as exemplified in some of the most important contacts between them, which has been written. Dr. Mascall has the necessary philosophical and theological ability and the required scientific knowledge, especially in mathematical physics, to enable him to do what I have not attempted to do, namely to deal with the problems he examines from a profound and academic philosophical point of view in considerable detail. Thus his book is in a sense complementary to mine. It is based on a Thomistic philosophy and somewhat rigid Catholic mediaeval orthodoxy which may not commend itself to all readers, and which many scientists may find strange; but none the less it is a most valuable and constructive treatment of some very important themes in the field of religion and science. I very much wish I had been able to make use of it and to discuss Dr. Mascall's views at various points in this book.

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- C. S. Sherrington, *Man on His Nature*.
- A. N. Whitehead, *Science and the Modern World*.
- E. Schrödinger, *What is Life?*
- K. M. Smith, *The Virus: Life's Enemy*.

The Oxford University Press:

- A. D. Lindsay, *Religion, Science and Society*.
- John Baillie, *Natural Science and the Spiritual Life*.
- W. H. Bragg, *Science and Faith*.
- Bertrand Russell, *Religion and Science*.
- E. D. Adrian, *The Physical Background of Perception*.

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- J. S. Huxley, *Evolutionary Ethics*.
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- Report on Pre-Frontal Leucotomy, issued by the Board of Control.

George Allen and Unwin, Ltd:

- J. S. Huxley, *Evolution: the Modern Synthesis*.
- J. W. Friend and J. Feibleman, *What Science Really Means*.
- Max Planck, *Where is Science Going?* and *The Philosophy of Physics*.
- C. H. Waddington, *Science and Ethics*.
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C. G. Jung, *Modern Man in Search of a Soul*.

J. H. Woodger, *Biological Principles*.

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Watts & Co.:

A. Keith, *Essays in Human Evolution*.

G. Bell & Sons, Ltd.:

H. Butterfield, *The Origins of Modern Science*.

James Clarke & Co.:

R. S. Lee, *Freud and Christianity*.

Student Christian Movement Press, Ltd.:

Karl Heim, *Christian Faith and Natural Science*, and *The Transformation of the Scientific World*.

Basil Blackwell:

F. Hoyle, *The Nature of the Universe*.

Ed. P. Laslett, *The Physical Basis of Mind*.

Jonathan Cape, Ltd:

Kenneth Walker, *Meaning and Purpose*.

Penguin Books, Ltd.:

A. D. Ritchie, *Civilisation, Science and Religion*.

V. H. Mottram, *The Physical Basis of Personality*.

C. H. Waddington, *The Scientific Attitude*.

Burns, Oates & Washbourne, Ltd.:

Alice Meynell, *Poems*.

S.P.C.K.:

ed. H. W. Bartsch, trans. R. H. Fuller, *Kerygma and Myth*.

The Dacre Press:

Austin Farrer, *The Glass of Vision*.

A. R. Mowbray & Co. Ltd.:

G. D. Yarnold, *Christianity and Physical Science*.

The Times Publishing Co. Ltd.:

Article on *Biological Progress*, in the "Times Literary Supplement".

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INTRODUCTION

SCIENCE and technology are among the dominant influences on life at the present time. The discoveries and inventions of scientists and technicians have revolutionized the conditions of daily life, work and amusement. But it is not only in material ways that science has affected human beings. Changes in the conditions of life inevitably alter the way men think about things, and the methods and attitude of science have in many ways influenced the ideas and thoughts of people, at any rate in this country. Moreover, when we consider how large a percentage of young people today are educated primarily on a scientific or technological basis and how the ideas and discoveries of science permeate, even if only in a simple way, the Press of this country, it is evident that science is indeed one of the most important elements in contemporary life and thought. It cannot be denied that in many cases the effect of this scientific influence, particularly on the technological side, has been to produce a materialistic and entirely "secular" view of existence.¹

On the other hand there are signs of distrust of scientific research among ordinary people,² as is only to be expected in view of the horror of modern wars, atomic weapons and bacteriological warfare; and in more intellectual circles it is widely felt that scientific knowledge alone gives a one-sided and inadequate conception of life and reality, and that some appreciation of literature and the arts is essential to full human development. But in addition to this, many people outside the ranks of professing Christians realize that some form of spiritual activity and religious faith is necessary for the health of human personality; while it is widely felt that science itself cannot deliver us from the dangers of the

¹ A vivid description of this has been given by Karl Heim in his recent book, *Christian Faith and Natural Science* (S.C.M. Press, 1953): see Appendix D, page 281.

² See *Puzzled People*, a Survey by Mass Observation, Chapter 16 (Gollancz, 1947).

misuse of its discoveries, and that salvation must be sought in religion. For these reasons the relation of religion to science, and the role of religion in a scientific age, are matters of urgent concern and frequent discussion to a large number of people. Again, when we remember the great part which the Christian Faith has played in the development of human character and of European civilization and culture, it is clear that the relationship between these two tremendous influences, Christianity and Science, is today a question of profound importance and one which cannot be ignored. Upon a proper alliance between them, upon mutual understanding, respect and collaboration between Christians and scientists, the future of mankind may depend.

It is perhaps unfortunate that just at a moment when it is urgently necessary that scientists and Christian thinkers should understand one another and that the Christian Church should give scientists that spiritual guidance and encouragement which they really need, the tendency in some ecclesiastical circles should be towards a form of theology which draws an "iron curtain" between the world of nature and the realm of the spirit. This theology is of a Lutheran or Calvinistic type. The effect of such theologies on the continent of Europe has been to suggest that from the world of nature the Christian can expect no clear or direct evidence of God and that he should not concern himself with it.¹ Theologians of this type fear that men, by such "natural religion", may come to create for themselves a conception of God which, springing from human reason or imagination, is in effect "an idol".² They assert that the only source of true knowledge of God is *direct* revelation through His Word. A sharp line is drawn between the use of reason and patient investigation of nature, on the one hand, and the truths of divine revelation on the other. Such suspicion of human reason and of nature may cause those who are influenced by it to distrust scientists and scientific research.

¹ For a brief discussion of the Barthian theology and its relation to Natural Science, see C. E. Raven: *Science and Religion* (Cambridge University Press, 1953), Appendix 9.

² See Appendix D, page 291, for an exposition of this in Karl Heim's works.

It is undeniable that this Barthian theology, coupled with the effects of the deliberately "anti-scientific" and "anti-rational" teaching of Kierkegaard in philosophy¹ with its insistence upon spiritual conflict and decision of an emotional type and its emphasis on conversion, rebirth and feeling, in contrast to intellect and reason, has tended to widen the gulf between scientists and Christian theologians and to produce not only distrust but actual misunderstanding and confusion of thought between the two.

It must, however, be stated that the leaders of this theology on the continent—Karl Barth, Emil Brunner and Karl Heim—have not themselves adopted so extreme a point of view as some of their followers. Karl Heim, perhaps the leading philosophical theologian allied with the Barthian school, has recently published two volumes² which show that he has a great interest in and understanding of scientific thought and investigation; and these books represent a most profound and original contribution to the discussion of the philosophical and theological implications of recent physical advances.

In the present book an attempt has been made to show how the Barthian insistence, that in the end the Christian faith rests not upon unaided human speculation or the shifting hypotheses of science or philosophy but upon divine revelation, can be combined with a proper understanding of, and respect for, human reason and scientific research. Another synthesis of Revelation and Reason has been produced by the Catholic "Neo-Thomist" theologians such as Maritain and Gilson; but this is open to objection from the scientific point of view, first, because it involves Aristotelian elements which, as will be indicated later, are incompatible with the presuppositions of science³; and secondly because it starts from metaphysical premises which many scientists would not accept, and most modern philosophers would emphatically reject, and proceeds by a method so "deductive" and abstractly logical that it leaves little room for the "inductive

¹ See Appendix C on Existentialism. Cf. the title of Kierkegaard's last big work, *Concluding Unscientific Postscript*.

² Summarized in Appendix D.

³ See Chapter I, section 6, page 21.

reasoning" from experimental data and results which is the essential characteristic of modern science.¹

Many other books dealing with the subject of religion and science have been published within recent years, some by scientists, others by theologians. Most of these seem to have suffered from one of two faults. Those written by professing Christians, especially by Christians who are not also research scientists, have suffered from a sense of distrust, fear, or even antagonism towards the scientific attitude, or have at least given the impression that the writers were on the defensive. In general such Christian writers, though they may have been conversant with scientific facts, have shown an almost complete ignorance and lack of understanding of actual scientific research work, and of the intellectual "atmosphere" of a research laboratory and the point of view and particular difficulties of a scientist. On the other hand, those books written by scientists have usually either been hostile to religion, frequently betraying a deplorable ignorance of the true nature of Christian belief and experience, or have confined themselves exclusively to a discussion of physics or astronomy in relation to certain aspects of the Christian Faith, and have even attempted to bolster up certain items of the Christian creed by deriving support for these from modern physical theories.

Mention must also be made of a tendency which has become increasingly apparent within the last two or three years in Britain, namely the adoption of a "Fundamentalist" view of the Bible, insisting upon verbal inspiration and a literal interpretation of both Old and New Testament, distrusting all scientific, historical or critical study of the Bible, and rejecting any scientific facts or principles which are not in strict accord with the literal teaching of the Bible. This of course involves the rejection of the whole concept of Evolution, particularly of the evolution of man, and the theory of Natural Selection. But it also implies an unquestioning

¹ For expositions of this "Neo-Thomist" synthesis see J. Maritain, *The Degrees of Knowledge* (Geoffrey Bles, 1937) and the same author's *Science and Wisdom* (Geoffrey Bles, 1940). A summary of this philosophical approach may be found in *Modern Thomistic Philosophy* by R. P. Phillips (Burns & Oates, 1934).

acceptance of all biblical miracles, at any rate in the New Testament, and an interpretation of Old Testament prophecies in a manner very contrary to that derived from scholarly study of these books. The evident intellectual obstacles and the glaring contradictions involved in such an uncritical and unintelligent attitude to the Bible does not prevent this Fundamentalism from making an appeal to some scientists and medical men, who must either be unaware of the difficulties it raises for any impartial student and of the patient and constructive critical and historical study of the Bible carried out by scholars and theologians during the past 50 years and more, or else must keep their scientific training and method on the one hand and their religious beliefs and ideas on the other in rigidly-separated watertight compartments. One may admire the enthusiasm of such Fundamentalist writers, their very real and genuine devotion to and reverence for God, but one cannot approve their biased treatment of scientific evidence or their lack of respect for the activity of the Holy Spirit in the human reason or the quest for scientific truth. It is impossible to believe that any real, satisfactory or permanent synthesis or reconciliation of Christian Faith and scientific knowledge and method can be reached along such "Fundamentalist" lines, and with such hostility to scientific evidence and scientific study of the Bible.

The purpose of the present book is twofold; first, to attempt to show that, so far from there being ground for any distrust or hostility on the part of Christianity towards science, there is so close a connection between them that there ought to be mutual trust, understanding and co-operation between scientists and Christian theologians; and secondly, to face and discuss frankly the very real problems and difficulties which arise, for Christian faith, in various fields of science, biological as well as physical or astronomical, and, for scientists, in some aspects of Christian teaching. This latter discussion is undertaken in the belief that the best means of reaching towards a solution of these difficult problems is by intellectual collaboration between scientists and theologians. The extent and diversity of these

problems is generally not fully recognised in books on the subject of science and religion. Such books often tend to confine themselves to one or two particular aspects of the matter and give no idea of the wide extent of the total field over which scientific and Christian conceptions impinge upon one another, or the variety and complexity of the questions that arise.

The plan of this book is as follows: we first examine in Part I the general presuppositions of science and their relationship to the Christian religion, and discuss general questions which concern the whole of science in its relation to the Christian faith. We then proceed, in Part II, to a detailed survey of advances in the various fields of science and try to indicate some of the most important implications and problems which arise for Christians in connection with scientific knowledge in each of these fields. Thereafter, in Part III, we discuss some elements in Christian belief, which present particular difficulties from the scientific standpoint. Finally, in three appendices various philosophical movements arising out of modern scientific thought are very briefly summarized; and in a fourth appendix an outline of two new developments in German Theology, specifically related to modern science, is given.

PART I
GENERAL QUESTIONS

CHAPTER I

THE PRESUPPOSITIONS OF MODERN SCIENCE

I. FUNDAMENTAL ASSUMPTIONS OF THE SCIENTIFIC METHOD

IT is often supposed by those who have not deeply considered the matter that modern science has no presuppositions. Many people appear to think that it has so justified itself that its conclusions can be accepted as absolutely reliable and certain, and that, in contradistinction to other types of thought, scientific thought need make no assumptions which it cannot prove, and the scientific method can alone give assurance of certainty. Such a belief would hardly be upheld by any reputable philosopher. There are, on the other hand, many modern philosophers who would argue that the most secure basis for reliable knowledge is to accept only statements which can be verified by direct observation or experiment.¹

The idea that science rests on no presuppositions can soon be brought into question by considering what Professors A. Einstein and L. Infeld have written in a book² which deals entirely with the history of the development of the ideas of physics. The authors, of whom the former was perhaps the best known of all present-day physicists, trace the growth of the fundamental concepts in this branch of science; but at the very end of their lengthy survey they conclude with certain general statements upon the field with which they have been dealing, and among these are the following: "We want the observed facts to follow logically from our concept of reality. Without the *belief* that it is possible to grasp the reality with our theoretical constructions, without the *belief* in the inner harmony of our world, there could be no science. This *belief* is

¹ See Appendix A: "Logical Positivism".

² A. Einstein and L. Infeld, *The Evolution of Physics* (Cambridge University Press, 1938).

and always will remain the fundamental motive for all scientific creation. Throughout all our efforts, in every dramatic struggle between old and new views, we recognize the eternal longing for understanding, the ever-firm *belief* in the harmony of our world, continually strengthened by the increasing obstacles to comprehension."¹

This quotation is very illuminating and will form a good starting point for our discussions. For in it the two distinguished writers say quite frankly and openly that science rests upon two assumptions or presuppositions. These (assumptions or presuppositions) are not made in regard to some particular field of science, but are rather (in the nature of an attitude to the natural world) and to the character of knowledge and of the human mind. They are of an absolutely fundamental type which we shall have to recognize as underlying all "science", in the sense of the scientific method or the scientific attitude. In all scientific thinking and method, in the scientific way of approaching the universe and studying it, there are inherent such presuppositions; unless we can reasonably presuppose these things and are prepared to do so, we shall not and cannot consider it worth while to employ the scientific method or to study the universe scientifically. These presuppositions are, of course, made quite unconsciously by most scientists today. For modern science may be said to have made its real start in the 16th and 17th centuries, and scientific work and thought have continued now for at least three centuries. In the course of this long period the presuppositions of science have received "empirical justification", that is to say, their soundness has been demonstrated by the fact that over so long a space of time they have been found to be justified by their intellectual and practical results. It is, therefore, quite reasonable for the modern working or research scientist, who is rarely trained in philosophy, not to bother about examining the presuppositions implicit in his attitude, but simply to do his practical work, following in the succession of those who have preceded him. But if we look back historically to the time when modern science was in its infancy in

¹ *Ibid.* pp. 312-313. Italics not in original.

the 17th century, we are then in a period when the pioneer scientists could not reasonably claim that their presuppositions had been justified by results. Scientific study and scientific experiment were only just beginning and the body of results achieved was so small that it could not be used as a powerful basis of argument. For this reason it would seem that in considering the presuppositions or assumptions which underlie the scientific attitude or method, we shall be well advised not to ignore the *history* of science, but rather to adopt a procedure similar to that taken, for example, by Professor A. N. Whitehead.¹

2. THE THREE CHIEF ASSUMPTIONS

(a) *Belief in the Orderliness of the Universe.* Returning to our quotation from Einstein and Infeld, let us look more closely at the two pre-suppositions or beliefs without which, they say, there could be no science. The first is "the belief in the inner harmony of our world". There are, in fact, two aspects of this belief. First, if we are to consider it worth while to carry out scientific experiments and to investigate the world scientifically, we must believe it to be the sort of world that is amenable to study by such methods. The essence of the scientific method is that it attempts from a mass of data, acquired by careful, patient and accurate experiment or observation, to deduce general principles. To quote Einstein and Infeld again, "Science is not just a collection of laws, a catalogue of unrelated facts. It is a creation of the human mind, with its freely invented ideas and concepts. Physical theories try to form a picture of reality and to establish its connection with the wide world of sense impressions. . . . With the help of physical theories we try to find our way through the maze of observed facts, to order and understand the world of our sense impressions."² As is well known, the research scientist begins by collecting a certain number of data as the result of the experiments he has performed or

¹ A. N. Whitehead, *Science and the Modern World*: (Cambridge University Press, 1926).

² *Op. cit.* pp. 310 and 312.

the observations he has made upon material objects. He then tries to arrange these data in some sort of logical order or form, and to unify and correlate them, thus arriving at some general principle which appears to connect and help to explain them. Having arrived at such a general principle, he then performs a large number of other experiments or makes a large number of further observations, and considers whether this additional evidence will support or overthrow the hypothetical general principle which he has put forward. This is the essence of scientific research procedure, even though in modern experiments the field or scope of the general principle concerned may be extremely limited. But such a procedure clearly presupposes that the world in which we live is one to which general principles can and do apply. (That is to say, it is a world which is fundamentally orderly, rather than disorderly, and which displays an element of rationality and design.) In a world in which things happened completely haphazard, in which there was no consistency or regularity, the attempt to apply such general principles would be foredoomed to failure from the start. To attempt to look for rational, intelligible design in a pile of bricks scattered at random by an idiot, is just waste of time and energy; but to attempt to discover fundamental design and principles in a work of architecture or engineering that has been planned and thought out by a rational mind is quite clearly a sensible procedure. Thus the scientist, in attempting to apply general principles to the world of nature, is in fact, whether he recognizes it or not, assuming that the world displays orderliness, consistency, regularity and rationality.¹

It is quite true that there are facts of ordinary daily experience which suggest that the world is of this sort. For example, we know (or imagine that we know) that the length of a day (i.e. the time taken by the Earth to make a rotation on its axis) is clearly defined, that the four seasons will recur regularly in their proper order, and so on. But we too easily assume that these facts are so evident that they are every-

¹ See J. W. Friend and J. Feibleman, *What Science really means*, p. 95 (Allen & Unwin, 1937): "If nature is not subject to law, then the whole of science is a fruitless proceeding."

where accepted without question. It has been pointed out by Dr. C. G. Jung, in a very interesting and original essay on the mentality of certain primitive races, entitled "Archaic Man", that many of these primitive races are very far from assuming that, for example, the seasons will recur regularly. In fact, they consider that it is only the performance of certain rites which will bring this about. We may reject this belief as pure superstition; but at least its existence in human minds shows that (it is not true that man must inevitably be led to the conclusion that the physical world is characterized by order and regularity) and Dr. Jung points out that the savage on his own grounds is just as logical as is modern civilized man. "It is", as he says, "on the facts of the world around him that primitive man bases his verdicts. . . . But he goes further than we. He has one or more theories about the arbitrary power of chance."¹ Thus, it is clear that we cannot dismiss as being self-evident the assumption, which the scientific method involves, that the universe and the world of nature display orderliness, regularity and consistency; and it is reasonable to interpret the phrase used by Einstein and Infeld, "the inner harmony of our world", as including this conception.

A. N. Whitehead wrote: "There can be no living science unless there is a widespread instinctive conviction in the existence of an *Order of Things*, and, in particular, of an *Order of Nature*. I have used the word 'instinctive' advisedly. . . . This remark is important in respect of the history of scientific thought. For we shall find that since the time of Hume the fashionable scientific philosophy has been such as to deny the rationality of science. . . . In view of this strange contradiction in scientific thought, it is of the first importance to consider the antecedents of a faith which is impervious to the demand for a consistent rationality. We have therefore to trace the rise of the instinctive faith that there is an Order of Nature which can be traced in every detailed occurrence. Of course, we all share in this faith, and we therefore believe that the reason for the faith is our appre-

¹ C. G. Jung, *Modern Man in Search of a Soul*, p. 152 (Kegan Paul, 1941).

Assume
can
order of
nature

hension of its truth.”¹ And again, “Faith in reason is the trust that the ultimate natures of things lie together in a harmony which excludes mere arbitrariness. It is the faith that at the base of things we shall not find mere arbitrary mystery. [The faith in the order of nature which has made possible the growth of science is a particular example of a deeper faith.] This faith cannot be justified by any inductive generalization. It springs from direct inspection of the nature of things as disclosed in our own immediate present experience.”²

(b) *Belief in the Principle of Causality or Intelligibility in the Natural World.* But there is a further presupposition which is closely associated with this first one and which underlies the whole of the scientific method. [This is the principle of Causality.] Here we are on more controversial ground, as will be made clear in a subsequent section of this book, for physicists have denied that Causality can any longer be regarded as a characteristic of the universe. But it may be argued that, in fact, there is here a confusion of thought. It will be seen later that certain phenomena in the sub-atomic sphere connected with Heisenberg’s “Principle of Uncertainty” do make it inherently impossible to treat causally the movements of electrons within the atom. The significance of this is that it is impossible to predict these movements. But it appears to be assumed by many physicists that if a thing is inherently unpredictable, it cannot have any rational cause. This does not seem to follow. In any case, the limited principle of causality which is in question in the sub-atomic sphere is very much more restricted than, and even different in character from, that fundamental presupposition which we are now considering. It will become evident from a simple illustration that the idea of Causality underlies the very scientific attitude itself. Suppose that some striking event takes place, for example that a very bright light of a most unusual and extremely beautiful colour suddenly appears in the sky. The reactions of those who see this will be of at least three types. Some, probably the major-

¹ *Science and the Modern World*, pp. 4 and 5.

² *Ibid.* p. 23.

ity, will simply register a direct sensation. They will exclaim, "Look at that!" or even, "Coo!" Others, those in whom the artistic instinct is strongest, will be immediately struck by the beauty of the sight and will exclaim, "How lovely!" or "How wonderful!" But others, those in whom the scientific instinct is most prominent, will at once say "Why did that happen? What caused that?" If it is admitted, as it has been by many eminent scientists and philosophers, that this last attitude is the characteristic one of the scientist, it follows that the notion of Causality is at the very root of the scientific approach to nature.] Bertrand Russell, for example, who cannot be suspected of any bias in favour of religious arguments, remarks in his book, *Religion and Science*,¹ "The discovery of causal laws is the essence of science and therefore there can be no doubt that scientific men do right to look for them. If there is any region where there are no causal laws, that region is inaccessible to science. But the maxim that men of science should seek causal laws is as obvious as the maxim that mushroom gatherers should seek mushrooms." Similarly, Waddington remarks that "Science works by discovering causes."²

Max Planck, the discoverer of the "Quantum Theory",³ to which Heisenberg's "Principle of Uncertainty" is a subsequent development, wrote as follows: "Of course it may be said that the law of causality is only after all an hypothesis. If it be an hypothesis, it is not an hypothesis like most of the others, but it is a fundamental hypothesis because it is the postulate which is necessary to give sense and meaning to the application of all hypotheses in scientific research. This is because any hypothesis which indicates a definite rule presupposes the validity of the principle of causation."⁴ In a later book he wrote, "It is true that the law of causality cannot be demonstrated any more than it can be logically refuted: it is neither correct nor incorrect; it is a heuristic

¹ Bertrand Russell, *Religion and Science*, p. 147 (Home University Library, 1935).

² C. H. Waddington, *The Scientific Attitude*, p. 110 (Pelican Books, 1941).

³ See Part II, Chapter 1, Section 3.

⁴ Max Planck, *Where is Science going?*, p. 150 (George Allen & Unwin, 1933).

principle; it points the way, and in my opinion it is the most valuable pointer we possess in order to find a path through the confusion of events, and in order to know in what direction scientific investigation must proceed so that it shall reach useful results."¹

Professor Susan Stebbing, while questioning some of Planck's statements, points out that the suggestion which appears to underlie the attitude of Eddington and Jeans, namely, that an event is causally conditioned only if it can be foretold with certainty, is carrying the matter too far, since no physical event can ever be predicted with complete accuracy. The discussion of this matter by Professor Stebbing may well be consulted.²

But even if we hesitate to use the word 'Causality', there can be no doubt that the asking of the question, ["Why did that happen?" or "How did that happen?"] is characteristic of science. Martin Johnson in his book, *Science and the Meanings of Truth*,³ substitutes for the word 'Causality' the term 'Intelligibility'. He says, "It is possible that when we unconsciously build a chain of scientific inquiry upon some hidden assumption, in place of the old faith in universal Causality, we rest instead upon the statement that '*Nature is intelligible*' . . . Such a version would demand no blind faith in Newtonian or other casual laws, and might join physics to more general epistemology; for it identifies the intelligibility of Nature with 'every event can be analysed into a *limited* number of independent elements'." Subsequently he says, "This requirement is equivalent to a confidence that ultimately '*Nature is intelligible*'. Without some such limitation of liability there would be no point in attempting to make sense out of observations of the external world."⁴

Thus, we find here, whether under the term 'Causality' or the term 'Intelligibility', a further assumption or pre-supposition about the nature and working of the universe,

¹ Max Planck, *The Philosophy of Physics*, p. 76 (George Allen & Unwin, 1936).

² Susan L. Stebbing, *Philosophy and the Physicists* (Methuen, 1937).

³ Martin Johnson, *Science and the Meanings of Truth*, p. 60 (Faber & Faber, 1946).

⁴ *Ibid.* p. 72. Cf. also A. D. Lindsay, *Religion, Science and Society*, p. 32 (Oxford Univ. Press, 1943): "Science assumes that reality is intelligible."

which must be accepted if we are to consider it worth while to attempt to study that universe scientifically. It may, perhaps, be remarked that the philosophy of Hume delivered a profound attack upon the whole principle of Causality; for he argued that the causal principle does not, in fact, exist in nature, but is only injected into it by the human mind. If this argument were accepted by scientists, it would, as Whitehead has pointed out, destroy the whole fabric of science; but, as he himself remarks, "Scientific faith has risen to the occasion and has tacitly removed the philosophic mountain."¹ Moreover, it is interesting to observe that although in *A Treatise of Human Nature*, Hume advances this theory, in *Dialogues concerning Natural Religion*, in which he is attempting to justify natural religion, he staunchly defends belief in the existence of God on the ground of the presence of design and order in the universe. In fact, the arguments put forward in these two books are incompatible.²

(c) *Belief in the Reliability of Human Reason.* We have now distinguished two senses in which we may interpret the statement of Einstein and Infeld that "without the belief in the inner harmony of our world there could be no science", namely, belief in the orderliness, regularity, consistency and rationality of the universe, and belief in the existence of Causality or Intelligibility in the universe. There is, however, a third presupposition of science put forward by Einstein and Infeld; for they add that "without the belief that it is possible to grasp the reality with our theoretical constructions . . . there could be no science." This amounts to a belief in the reliability of human reason. If we are to study the universe by means of our mind or reason, we must have some degree of faith in our capacity to distinguish truth from error and to make theoretical constructions which bear some measure of relationship to reality. If we thought that our minds were incapable of leading us into reliable knowledge, we should hardly consider it worth while to attempt to get information about the universe by the use of our minds,

¹ *Op. cit.* p. 5.

² Cf. A. S. Pringle Pattison, *The Idea of God*, Chapter 1 (Oxford University Press, 1920).

which is precisely what we do in science. Now it is evident that the human mind does, in fact, frequently mislead men, for we all know how easy it is to make mistakes or fall into error. Why, then, should we have that faith in the power of our minds which is necessary before we can consider it worth while to do science?

3. THE THEOLOGICAL BASIS OF THESE PRESUPPOSITIONS

The great French philosopher, René Descartes, perhaps the greatest pioneer of modern scientific philosophy, found himself confronted by this question in his *Meditations*. He wished to find a ground for believing that the "clear and innate ideas" of our minds could be accepted as reliable. He could find such a ground only in the argument that the human mind, like all other things, is created by God, that we know that God is a God of Truth and not a God of Falsehood, and that it is inconceivable that a God who is a God of Truth should deliberately implant in man a faculty of reason and a thinking mind for the express purpose of leading him into error. "Every clear and distinct conception is doubtless something, and as such cannot owe its origin to nothing, but must of necessity have God for its Author—God, I say, Who, as supremely perfect, cannot without a contradiction be the cause of any error; and consequently it is necessary to conclude that every such conception is true." (Meditation IV.)

Many criticisms have been levelled against this argument of Descartes, but I am not aware that anyone has found any really satisfactory alternative to it. What other ground can we find to justify that reliance on the human mind which is essential to science, save faith in God, and in a God of such a character as He Who is revealed by the Christian Revelation? (Thus, we see that this third presupposition of science can only be justified on the basis of religious faith and revelation.) It is significant that those modern philosophies, such as Marxism, Logical Positivism and Freudianism, which have explicitly denied the existence or reality of God, have been precisely the philosophies which have also been led to doubt

the reliability of the human mind and faculty of reason. (See Appendices A and B.)

But if we consider the matter, we shall find that the same is true of the two earlier presuppositions. For what ground can we have for believing in the universality of order, regularity, consistency and rationality in the universe, unless we believe the material world to be the work of a single, rational, divine Mind? Elsewhere, whenever we find any object which displays these characteristics, we observe that it has been deliberately planned, thought out and constructed by a rational mind. We do not find any regularity, order or form about objects which have been strewn here and there and carried hither and thither by blind inanimate forces or by unconscious or idiotic beings. How can we possibly believe that the universe will exhibit such characteristics unless, on some prior ground, we have reason to believe that it is the work of a rational, creative, designing Mind? If men possess already a religious faith and conviction which makes them hold this belief about the universe, they will then regard it as worth while to study the universe scientifically; but if they have no such belief, why should they ever contemplate starting to employ the scientific method?

Again, if we believe the universe to be created or controlled by different and divergent minds and wills, we cannot expect that it will exhibit regularity or order or consistency. Those who have read Homer will recollect how in the war between Greece and Troy certain of the mythical gods supported the Trojans and others the Greeks, and how from time to time they interfered in battles, so that if the Trojans were winning, a god or goddess who supported them might prolong the length of the day to enable them to achieve complete victory; while, on the other hand, a god or goddess who opposed them would conveniently intervene to shorten the length of the day in order to save the Greeks from being overwhelmed. Such a state of things might well exist in a universe which was at the mercy of disputing deities; and in any such universe science would be completely impossible, since events would be due to purely arbitrary and unpredictable causes. It is therefore clear that it is only when men believe

in one single creating and controlling divine, rational Mind that they will hold that view of the universe which alone can impel them to study it scientifically. Whether we consider the element of design, order, regularity and consistency, or the element of causality and intelligibility, it is surely clear that such elements can only be present in a world which is the work of a creating and controlling rational Mind. So we are led to conclude that those who first began to study the natural world by the methods of modern science were impelled to do so because they held Christian beliefs and because those beliefs gave them the conviction that the universe was of such a character that it was worth attempting to study it scientifically. Thus it is apparent that if we look far enough we shall find that modern science rests upon a foundation of religious belief, and is based upon assumptions which can only be justified by *monotheistic* faith. Science rests upon acts of faith. In the quotations we have already given, we have seen how the word *belief* recurs again and again. A. D. Ritchie says in his book, *Civilization, Science and Religion*: "The sciences based on observation presuppose an act of faith; that truths can be found if they are sought for hard enough and persistently enough and that all partial truths fit together to make a wider truth. This is an act of faith, not a discovery from experience, because it is a necessary condition for seeking experience."¹

4. THE NECESSITY FOR SCIENCE OF BELIEF IN ONE RATIONAL GOD

Two things apparently follow from the line of argument we have been pursuing: first, that the scientific attitude to the universe and the development of the scientific method of study can only take place in an intellectual civilization in which the dominant religious faith is at any rate one of *monotheism* and of belief in a single, rational, divine Being Who both creates and controls the universe; and, second, that the pioneers of modern science must have been men of

¹ A. D. Ritchie, *Civilization, Science and Religion*, p. 43 (Pelican Books, 1945).

real Christian faith, to whom it came naturally to make the assumptions which we have been examining, just because they were firm and convinced Christian believers. In regard to the first of these it may suffice to point out that the scientific approach to the universe developed first in ancient Greece. The first experimental scientists were the Ionians, who both accumulated data and also were distinguished for their courageous speculation about the nature of the universe. But the scientists who can most truly be called the founders of scientific *thought* were the great Greek philosophers, particularly Aristotle, who had passed beyond the stage of Greek mythology to belief in one single, divine Mind or First Cause. So long as the Greeks were dominated by polytheistic mythology, their science made no great advance. Similarly, in countries such as Egypt, where certain branches of science had their beginnings from purely utilitarian motives they never advanced beyond the very first stage, because the attitude of the Egyptians to nature, derived from their religious faith, was not such as to stimulate them to employ the scientific method. In more recent times it is interesting to note that the development of science has occurred almost entirely in Europe until very recent years, and that the one great exception to this, the preservation of science during the Dark Ages in Arabia, also occurred in a country where the religious faith was Islam, a primary tenet of which is that there is one God and only one God. Yet, although considerable advances in some sciences occurred in Arabia, the Moslem faith could never become an adequate foundation for the true spirit of natural study and scientific research, since its doctrine of God is one which emphasises His "transcendence", and thereby makes Him remote from any control of events in the natural universe. It was only in Christian Europe that modern science really blossomed; and, as we shall explain later, this blossoming only took place when the pagan Greek element in European philosophy had been expelled from Christian theology. It is interesting to note that in the Eastern countries, such as India, where the dominant faiths were Hinduism and Brahminism, which lack the monotheistic conception of God necessary to

justify the scientific philosophy of nature, modern science did not develop at all,¹ and it was only the incoming of Christian European civilization which induced in India a scientific attitude to the problems of health, housing and so on.

5. THE DEPENDENCE OF SCIENCE ON A RELIGIOUS ATTITUDE TO NATURE AND MATTER

Moreover, the desire and impetus to study the world of nature can only arise in the presence of a civilization and a religious faith which have the necessary attitude to material things. Many of the Eastern faiths regard matter and all things physical and bodily as either definitely evil or else unreal and illusory. It is well known that Manichaeism, a religion which arose in Persia and played an influential part in the thought of the Near East during the early centuries of Christianity, held that all matter was evil and all bodily or sensual enjoyment was forbidden. The same idea characterized many of the Gnostic systems of religion which were prevalent at the same time. On the other hand, religions such as Brahminism and Buddhism regarded material things and physical things as unreal and illusory. Buddha taught that all suffering arose from a desire for change, and that change was a quality of material things and the desire for it arose from the desire for material things. Therefore, if one could detach oneself entirely from material things and from every form of personal desire, one could attain a state of Nirvana in which, having no desires, one would no longer be exposed to suffering and pain. Pain itself arose from physical things, and if one could become

¹ Cf. A. N. Whitehead: "I do not think, however, that I have even yet brought out the greatest contribution of medievalism to the formation of the scientific movement. I mean the inexpugnable belief that every detailed occurrence can be correlated with its antecedents in a perfectly definite manner, exemplifying general principles. Without this belief the incredible labours of scientists would be without hope. . . . In Asia, the conceptions of God were of a being who was either too arbitrary or too impersonal for such ideas to have much effect on instinctive habits of mind. Any definite occurrence might be due to the fiat of an irrational despot, or might issue from some impersonal, inscrutable origin of things. There was not the same confidence as in the intelligible rationality of a personal being." *Science and the Modern World*, pp. 15-16.

unconscious of physical things and even of oneself, one would escape from pain. Thus, Buddhism holds that to concern oneself with material things is a foolish mistake. It will, of course, follow that the scientific effort to cure disease and other evils by physical methods is a waste of time; and that is one of the reasons why Indian reformers, until they were influenced by Christianity, considered it futile to attempt to employ scientific methods for the benefit of humanity.

In order that men should be impelled to study the natural world with that devotion, care, patience and thoroughness which are essential to the scientific method, they must have a very different attitude from this to material things. Christianity was once said by the late Archbishop William Temple to be "the most avowedly materialist of all the great religions"¹. By this he meant that more than any other religion Christianity treats matter as being both *good* and *real*. This attitude to matter is based upon three theological beliefs.

1. *The Doctrine of Creation*. Christians believe, as did the Jews before them, that the material world and everything in it is created by God and exists only through His Will and sustaining Power. It therefore follows that material things cannot possibly be bad in themselves, since it is inconceivable that the workmanship of the all-good God and divine Craftsman could be anything except good. Thus, the Christian treats the natural world and bodily things as being inherently good in themselves and as being something to be treated with reverence and respect.

2. *The Doctrine of the Incarnation*. Christians, in contradistinction to the followers of other religions, believe that God Himself came to dwell among men on this material earth in a normal human body consisting of actual chemical atoms and molecules, and real human flesh, blood and bone. As is made clear by the Nicene Creed and the Athanasian Creed, Christians believe that Jesus Christ was both wholly Man and wholly God, "perfect God and perfect Man, of a

¹ W. Temple, *Nature, Man and God* (Macmillan, 1934), p. 478.

reasonable soul and human flesh subsisting". Centuries of devoted thought and deep consideration of all the facts and factors convinced Christian theologians that no doctrine of the Incarnation is satisfactory which denies the true and real humanity of Christ and the actual existence of His true human body. Various Christian Gnostics in the early centuries attempted to deny the reality of Christ's human body on the very ground that their Gnosticism suggested that material and bodily things were evil; but the wisdom of the Christian Church decisively and finally rejected this falsehood. Thus, because they believe that Jesus Christ was true Man, dwelling in a real, human physical body, Christians are bound to believe that matter was good enough and holy enough to be the dwelling place of God himself. For this reason, again, they must hold that material things and the natural world are good, and even holy, in themselves.

3. *The Sacramental Principle.* Finally, the Christian Church has always accepted the sacramental view of material things. In the Christian Sacraments there must always be, in the words of the Catechism, "an outward and visible sign of an inward and spiritual grace", and from the Sacraments the Christian learns that material things can become both the symbols and the "effective agents" of spiritual power. For this third reason, also, the Christian is bound to look upon nature from a sacramental point of view, and to believe that in natural and material things he may discover the "outward and visible sign" of "inward and spiritual" truths.

As a result of these various doctrines, Christianity has always had a positive view towards nature and material things. It is perfectly true that at various periods and in various places there has been present in Christian thought another element, of distrust of the body and even of material things generally; but, as Canon C. E. Raven has pointed out,¹ this is really a perversion of the original Christian attitude taken up in the Gospels. It derives from two sources:

¹ C. E. Raven, *The Gospel and the Church* (Hodder & Stoughton, 1939). See also his recent Gifford Lectures, *Science and Religion* (Cambridge University Press, 1953).

first, a natural and inevitable reaction against the licentiousness of the Roman civilisation of the first three centuries of the Christian era; and secondly, the infiltration into Christianity of Gnostic and Manichaean ideas, even through the unconscious influence of St. Augustine of Hippo, perhaps the greatest of all Christian thinkers, who had in his earlier life been both a Manichaean and a Neoplatonist and had never altogether thrown off the influence of these systems.

Yet this is clearly a departure from the attitude of the New Testament and is no part of true Christianity. Where men have held the real Christian faith, they have inevitably adopted an attitude of respect and even reverence towards the world of nature. Moreover, the more they have been filled with love and devotion for God, the more affection they have inevitably felt for the world of nature which is His creation. Thus, whereas the Brahmin or Buddhist faith would lead a man to regard it as foolish to study nature, and the Manichaean faith as sinful to do so, the Christian faith gives a direct incentive and even inspiration to such study; and it is therefore within Christian civilization that we should expect to find, as we do, the development of the study of nature, through the methods of science.

It should be clear from what has been said both that the presuppositions or assumptions with regard to the nature of the universe which modern science must make can only be justified by the Christian faith, and also that the impulse and incentive which moved the pioneer scientists to devote themselves to the study of the natural world came from Christian doctrine and the Christian view of matter. For if we believe the full Christian faith about God and His relation to the world, that faith will justify us in making the presuppositions necessary to science, and we shall have no hesitation in doing so. But there is no other ground on which we shall be justified in making them. Nothing but the belief that the universe is the intelligible work of a rational designing Mind; nothing but the belief that God is a God of Truth who has created the human reason; nothing but the belief in one single, creative Mind and Will, infinite in wisdom and power, yet showing diversity in unity; nothing but belief that the world

is His creation, can justify the assumptions underlying modern science. Only the full catholic Christian faith can supply both the necessary theological and philosophical beliefs as to the nature of the universe which are required to justify studying it by the scientific method, and also the impulse and inspiration which will impel men to undertake this study.

Herein lies the way out of that danger which, as was mentioned in the Introduction, many theologians, particularly the followers of Karl Barth, have seen in the attempt to reconcile religion and science and in the acceptance of the value and spiritual significance of the natural world. They fear that this may imperil the revealed dogmas of Christianity. But while the procedure and activities of scientific research are grounded in experiment and experience or observation, yet, as we have now seen, the whole structure of scientific method is itself founded upon certain presuppositions. These presuppositions cannot be arrived at by experiment or experience, but are derived from certain Christian dogmas; and these dogmas, in turn, express facts divinely revealed to man in certain supreme events in time and history, which have also an eternal and divine significance, and are the "mighty acts" of God's salvation and revelation. Theologians are right in saying that through these great acts God has revealed to man truths about His nature, character and activity, which could never be known by any effort of human reason, any investigation of nature or any type of experimental research. Those who would attempt to establish or safeguard these revelations by any appeal to the data of science misunderstand the limitations of the human mind and the nature and extent of scientific knowledge and of divine revelation.

The great Christian dogmas are the expression, in rational and logical terms, of this divine revelation, though the revelation itself is given not in terms of words but of actions. Yet without the knowledge of God and His creation which comes from this divine self-revelation, it would be impossible to justify the presuppositions which underlie all science, and the inspiring motives of modern scientific research would

have been lacking. Thus, the approach we have indicated to the relation of science and Christianity safeguards the uniqueness of the Christian revelation, and the fact that the only true knowledge of God must be rooted and grounded in His self-revelation rather than in the observations, investigations and speculations of men. This fact shows the folly of attempting to erect a man-made image of God in place of the divine character and truth revealed in Jesus Christ. But it also indicates that for this very reason, once the presuppositions of science are recognized, there is no danger of the consideration of scientific knowledge leading to such idolatry; and the acceptance of the need for the divine self-revelation does not preclude a proper appreciation of the spiritual value of the natural world and of scientific research. (So far from science being a rival to Christianity, its true function is to be the child of Christian faith and dogma.)

The whole subject may be summed up in the words of Professor J. Macmurray, as follows: "Science is the legitimate child of a great religious movement, and its genealogy goes back to Jesus. In its true sense science is the one proper, positive expression of Christianity that the world has seen. The only positive Christian thing in the world as yet is modern science."¹ Similarly, N. Berdyaev says, "I am convinced that Christianity alone made possible both positive science and technics. (As long as man had found himself in communion with nature and had based his life upon mythology, he could not raise himself above nature through an act of apprehension by means of the natural sciences or techniques."²)

6. THE RELATION OF CHRISTIAN DOCTRINE AND GREEK PHILOSOPHY TO MODERN SCIENCE: GOD'S OMNIPOTENCE AND INFINITY

Such considerations have recently led two Oxford philosophers, Professor R. G. Collingwood and Mr. M. B. Foster, to study the relation of modern science to Christian belief at

¹ J. Macmurray, *Reason and Emotion* (Faber, 1935).

² N. Berdyaev, *The Meaning of History*, p. 113 (Geoffrey Bles, 1936).

greater length; and R. G. Collingwood, in his book, *Essay on Metaphysics*, goes so far as to say: "The presuppositions that go to make up this Catholic Faith, preserved for many centuries by the religious institutions of Christendom, have as a matter of historical fact been the main or fundamental presuppositions of natural science ever since. They have never been its absolute presuppositions, there have always been others, and these others have to some extent differed at different times. But from the fifth century down to the present day all these differences have played their changing parts against a background that has remained unchanged: the constellation of absolute presuppositions originally sketched by Aristotle, and described more accurately, seven or eight centuries later, by the Patristic writers under the name of the 'Catholic Faith'."¹ Collingwood, indeed, argues that science requires to assume two things—the fundamental unity of nature and the divergence of realms within this unity—and that such a view is only harmonized in the Christian doctrine of the Trinity. Foster points out that the mediaeval Christian philosophy consisted of two elements, a specifically Christian one and a Greek one derived from Plato and Aristotle, and that the Christian element was favourable to science, whereas the Greek was not. For example, the Greek philosophers did not possess a doctrine of the unity of God, such as was required to justify the scientific view of the nature of the world. He says that "the method of natural science depends upon the presuppositions which are held about nature, and the presuppositions about nature in turn upon the doctrine of God." He has argued his point in two papers in the philosophical journal, *Mind*, parts of which we summarize in the following pages.²

Aristotle distinguished various types of Causation. Of these

¹ R. G. Collingwood, *Essay on Metaphysics*, p. 227 (Oxford University Press, 1940). See also the whole of Chapter 21.

² *Mind*, Vol. 43, No. 172, pp. 446–469. Vol. 45, No. 177, pp. 1–27.

This section owes much to the excellent statement of the argument by John Baillie, *Natural Science and the Spiritual Life* (Oxford University Press, 1951), and also his chapter entitled "Christianity in an Age of Science" in *Science and Faith Today* (Lutterworth Press, 1953).

perhaps the two most important were Mechanical or "Efficient" Causation and Final Causation. By the first he meant Causation by previous events, i.e. a thing is caused by what has occurred just previously in time; and by the second he meant Causation by ends or purposes, i.e. a thing is caused by the purpose for which it is brought into existence; and he held that, while one must take into account the mechanical explanation of a thing's existence, no phenomenon can be fully explained until the purpose which it serves has also been taken into account. The pioneers of modern science, notably Francis Bacon and René Descartes, repudiated this Aristotelian teaching. They excluded purposive explanation from scientific procedure, and banished "final causes" from physics. They did not suggest that there are no final causes, but only that these are not the concern of natural science. Nor did they mean that there is no purpose in nature, but only that such a purpose cannot be discovered by scientific, experimental, empirical methods. Thus, Francis Bacon argues that he is not decrying or doubting the providential ordering of nature by saying that it is inscrutable to scientific observation: on the contrary, he is exalting it. "The wisdom of God is more wonderfully displayed when nature acts in one way and providence elicits from it something else, than if the characters of providence were stamped on all nature's forms and movements."¹

Similarly, Descartes says: "Finally, we shall not seek for the reason of natural things from the end which God or nature has set before Him in His Creation; for we should not take so much upon ourselves as to believe that God could take us into His councils. . . . But we shall merely try to discover by the light of nature that He has placed in us, applied to those attributes of which He has been willing we should have some knowledge, what must be concluded regarding the effects that we perceive by the senses. But we must keep in mind what has been said, that we must trust to this natural light only so long as nothing contrary to it is revealed by God Himself."²

¹ Francis Bacon, *De Dignitate et Augmentus Scientiarum*, iii, 4.

² R. Descartes, *Principles of Philosophy*, Part I, Principle XXVIII.

It has been suggested that in thus limiting the sphere of science Descartes was trying simply to banish the question of final causes to a position in which it would no longer trouble him; but, in fact, the reason why Bacon and Descartes broke with the authority of Aristotle was that they found themselves working with a different conception of God and of His relation to the world. In pagan Greek mythology the physical world was believed either to have been generated by God or to have emanated from Him, or at any rate to be of the same nature as God. Thus, nature itself was regarded as divine and was self-explanatory. Therefore, in looking within nature itself for final causes, Bacon argued, Aristotle was 'substituting nature for God' and consequently 'had no further need of God'. The consequence was that ancient science was essentially deductive in method, i.e. it hoped to understand the world by pure deductive reasoning rather than by observation or experiment. Once the pattern had been discovered, the details could be deduced by reason and logic. Once the essence¹ of natural objects was known, one could infer their behaviour from it. On the other hand, Bacon and Descartes argued that the divine pattern is hidden from us and therefore we must begin from the other end, the scientific method must be inductive rather than deductive, based upon observation and experiment, using the evidence of the senses for demonstration and "classifying the species instead of dividing the genera".

But why did these pioneers of modern scientific thought believe that the pattern was hidden from us? The answer is that they drew this belief from the Christian revelation, and especially from the Christian doctrine of Creation, which teaches that the world of nature is not in itself divine but is dependent upon, or, to use the philosophical expression, 'contingent upon', the Will of God. Thus, we see that the Greek pagan element in Aristotelian thought, with its pantheistic conception of the divinity of nature and consequent insistence on final causes, was prejudicial to the development of the scientific observational and experimental

¹ See Appendix C on Existentialism.

method. It was when this pagan element was eliminated from philosophy that the development of modern science really began; and the pagan element was removed by a clearer understanding of the Christian doctrine of Creation. M. B. Foster writes: "What is the source of those un-Greek elements in the modern science of nature by which the peculiar characteristics of the modern science of nature were to be determined?" and answers, "The Christian doctrine of Creation."¹ Again, he says, "The method of Galilean science . . . presupposes (a) that it is impossible that nature should not embody a mathematically intelligible scheme and exhibit laws mathematically definable; but (b) that, which of possible alternative schemes it embodies, and which of the several laws equally definable mathematically it exhibits, can be decided only by appeal to observation and experiment."² Of these two presuppositions the first was inherited from the Greek tradition of Pythagoras, Plato and Aristotle; but the second was derived from the Christian doctrine that the actually-existing order of nature is dependent upon the divine Will.

As Professor John Baillie says in his philosophical discourse to the British Association in 1951, on which the summary just given is based: "It is to the clear recognition of this element of contingency in nature that modern science owes its very being. Socrates seems to have thought that he could begin by discovering the ideal pattern of nature and deduce from that the details of its progress. . . . Furthermore, the Socratic view assumes that God *had* to make the world just as He did make it, that its specific character flows by necessity from His Nature, and therefore that it could not be otherwise than it is. This, however, is a position which Christian thought has never been able to accept. Christianity has always insisted that the world of nature is no mere emanation of the divine Reason but a free creation of the divine Will. . . . We must indeed say with Socrates that all things were ordered by the divine wisdom, but we must not say that there were no alternatives between which the divine wisdom had to choose. From this it follows that while

¹ *Mind*, Vol. 43 (1934), p. 448.

² *Mind*, Vol. 45 (1936), p. 24.

everything in nature observes a rational pattern, and is therefore in principle intelligible by us, we cannot know in advance which rational pattern it is going to follow. . . . The reason why ancient science was so little observational and hardly at all experimental was that in holding so fast to the intelligibility of the world it failed to do justice to its contingency."¹

Thus, the Christian doctrine of Creation, and its necessary corollary of the contingency as well as the intelligibility of nature, supplies another of the presuppositions which underlie belief in the validity of the modern scientific method. Here it may be remarked that certain mathematicians and philosophical scientists have in some degree questioned the element of contingency and have argued that, given certain initial data, it ought to be possible to deduce by purely logical and mathematical methods the nature of every detail of the physical world. This, however, would seem to be contrary both to Christian theology and to the experimental method of science. Similarly, the philosophical implications of pantheism, and of any doctrine which holds that nature itself is divine, are seen to be incompatible both with Christian faith and with scientific philosophy. Professor Basil Willey has pointed out how by a curious transition the ultimate effect of the mathematical scientific philosophy of the 17th century was to provoke a romantic reaction in the late 18th and early 19th centuries, which led to a pantheistic view of nature;² but this never affected the scientific thought of that period, though it appears to have influenced and confused the thought of a number of writers and a few scientists venturing upon philosophy in the present century.

Again, according to the Aristotelian doctrine, the celestial bodies were animate. Aristotle did not attribute animal or vegetative soul to the stars, but gave them an immortal mind and an indestructible body. It was pointed out by Philophrus in the 7th century that this Greek doctrine

¹ John Baillie, *Natural Science and the Spiritual Life*, pp. 22-25 (Oxford University Press, 1951).

² Basil Willey, *Christianity Past and Present* (Cambridge University Press, 1952).

of the animacy or even quasi-divinity of the stars is inconsistent with the Christian doctrine of God. Moreover, Aristotle held that the material of the celestial world is of a different kind from that of the terrestrial world. While such doctrines were modified in the course of the Middle Ages, particularly by St. Thomas Aquinas, who denied the divinity of the heavenly bodies, much of the Aristotelian astronomy remained in mediaeval Christian thought and was completely incompatible with the fundamental basis of Newtonian physics. Kepler stated, "My object is to describe the universe not as an animal but as a watch", and "He that describes the celestial bodies as animate derogates from the glory of the Creator, since it would give them the power of independent action." What is even more important from the scientific point of view is that such a view would introduce an element of indeterminacy and arbitrary fortuitousness into the movements of the stars which would render them completely beyond the possibility of scientific, mathematical or physical observation. But in the Aristotelian universe things that were in motion had to be accompanied by a mover all the time. "A universe constructed on the mechanics of Aristotle had the door half way open for spirits already; it was a universe in which unseen hands had to be in constant operation and sublime intelligences had to roll the planetary spheres around. Alternatively, bodies had to be endowed with souls and aspirations, with a "disposition" to certain kinds of motion, so that matter itself seemed to possess mystical qualities. The modern law of inertia, the modern theory of motion, is the great factor which in the 17th century helped to drive the spirits out of the world and opened the way to a universe that ran like a piece of clockwork. Not only so—but the very first men who in the middle ages launched the great attack on the Aristotelian theory were conscious of the fact that this colossal issue was involved in the question. The first of the important figures, Jean Buridan, in the middle of the 14th century pointed out that his alternative interpretation would eliminate the need for the intelligences that turned the celestial spheres. He even noted that the Bible provided no authority for these spiritual

agencies—they were demanded by the teaching of the ancient Greeks, not by the Christian religion as such.”¹

It is clear that the Aristotelian doctrine of the nature and movement of the celestial bodies was incompatible not only with modern science but also with Christian theology², as Philophilus, Buridan and Kepler realized. Here again, what was required before science could progress was a purgation of mediaeval doctrine from the ancient Greek astronomical and philosophical notions in it, and a return to something more like the biblical doctrine of the nature of the stars which should be compatible with Christian theology and the Christian doctrines of the contingency of all created things and the omnipotence of God.

The Christian doctrine of Creation and of the contingency of nature is closely related to a further Christian doctrine concerning God, namely the doctrine of His omnipotence or almightiness. If we believed that nature was independent of God, rather than dependent upon or contingent upon His Will, this would in fact constitute a limitation of the divine power, an infringement of the divine omnipotence. But another divine attribute, associated with omnipotence, is infinity. A. D. Lindsay has pointed out that “The beginning of the modern adventure in both science and religion was the revival of the essential Christian conception of the infinity of God and the consequent realization that God had given man an infinite task in understanding

¹ Herbert Butterfield, *The Origins of Modern Science*, pp. 7 and 8 (G. Bell & Sons, Ltd.).

² *Note*: what has been said above is not to be taken as meaning that Aristotle’s scientific ideas and opinions were entirely erroneous or wholly bad. It is pointed out by Butterfield that in the sphere of physiology the influence of Aristotle was in many ways a beneficial antidote to that of Galen, and that the University of Padua, of which Copernicus, Galileo and William Harvey were all students became the centre of astronomical and physiological research, precisely because the interpretation of Aristotle in the University was largely concerned with his writings on the physical universe and was carried out in collaboration with a medical faculty. Here Aristotle was studied apart from the Christian synthesis into which his system had been built by St. Thomas Aquinas, and this led to a much greater freedom of criticism and interpretation of Aristotle, so that the freedom of thought enjoyed by Padua was unique in Europe. It is significant that towards the end of the 16th century the Paduans were questioning whether final causes ought to have any place in natural philosophy.

and doing His Will and knowing His world. This meant the giving up of all formulations of the Will of God which claimed to be final and all intellectual constructions into which new discoveries had to be fitted. It meant a belief in experiment and diversity. It meant finally—and this was alike the glory and the danger of the adventure—that the unity which was to keep men together in this many-sided experiment could not be a unity of accepted formulae but the unity of a common life of fellowship.”¹

He then maintains that inasmuch as this attitude was characteristic of the Reformation as well as of the beginning of modern science, the one was related to the other. It was the escape from the rigid formulae characteristic of mediaeval Aristotelianism and scholasticism which enabled the spirit of experimental science to develop.²

Similarly, on the moral side “Greek metaphysics reflected the dominance of the static and the unchanging”, whereas the Christian affirmation that God is Spirit “brought together omnipotence and life, eternity and change, infinity and goodness.”³ . . . Moral action will not be the copying or imitation of a changeless pattern—as in a world where changeless patterns are more real than living, changing persons. Morality will be itself creative and growing and developing.”⁴

¹ A. D. Lindsay, *Religion, Science and Society*, pp. 10, 11 (Oxford University Press, 1943).

² It may be remarked that Leonardo da Vinci, perhaps the most brilliant intellect of all time and an outstanding scientific pioneer of the 15th to 16th century, was distinguished, as is shown by his notebooks, by a freedom of religious thought and interpretation closely akin to that of the greatest of the humanists of the Reformation period.

³ Professor H. Butterfield in *The Origins of Modern Science* (Bell, London, 1949), points out that, whereas Newtonian physics was based upon the conception that a body in motion will continue in motion unless some agency interferes with this motion, Aristotelian physics regarded rest and not motion as the natural state of bodies and assumed that bodies would return to a state of rest when left to themselves. “The Aristotelian doctrine of inertia was a doctrine of rest. It was motion, not rest, that always required to be explained. Wherever this motion existed, and however long it existed, something had to be brought in to account for it” (p. 3). Similarly, O. Spengler in *The Decline of the West* pointed out that Greek art and culture generally was essentially static in character.

⁴ *Op. cit.*, p. 12.

Lindsay then examines the relation of Cartesian philosophy to this conception of infinity and development, and concludes that inasmuch as modern sciences admit their fallibility and recognize that their truth is provisional, their attitude is "very closely connected with a conviction of the infinite nature of the task upon which science is engaged, infinite because reality is infinite. The world for science is as intelligible, but as incomprehensible, as God is proclaimed to be in the Athanasian Creed."¹

He argues further that this conviction only became clear at the time of the Reformation. "We are accustomed nowadays to the conception that science will go on indefinitely making discovery after discovery. So far as I can make out, this notion of progress to infinite perfection appears first in religion. The seventeenth-century scientists, Descartes at least, seem to have thought that knowledge of the natural world was a job which could be completed in a reasonable time. The modern conception of the endlessness of scientific knowledge is not, I think, earlier than the eighteenth century."²

Lindsay shows that the philosopher, Kant, in stating a metaphysics for science, insists that "science is not a deduction from first principles. It is always a combination of general principles and experiment. As the facts are infinite and of infinite diversity of character and rule, knowledge is a never-ceasing quest."³ Thus, the task of the scientist is not to attain a complete, comprehensive and fully satisfying delineation and explanation of the whole natural world in the sense in which some of the mediaeval logical thinkers imagined it to be. Rather it is to press ever onward in the quest for knowledge by means of investigation and experiment, as well as of deduction, in the faith that there is no limit to the truth to be discovered. For the wisdom of God is not confined or limited or expressed in the creation of something which can be completely described, but the works of divine wisdom are infinite in complexity and in their totality beyond the grasp of the human mind.

It should be observed that Lindsay speaks of this conviction

¹ *Ibid.* p. 30.

² *Ibid.* p. 18.

³ *Ibid.* p. 31.

having emerged in the 18th century, and it is pointed out by Professor H. Butterfield that in fact the early state of the Reformation was as mediaeval in many respects, and even as Aristotelian, as the pre-Reformation mediaevalism itself was. In fact, Luther and Calvin were as rigid in their theological and philosophical outlook as any mediaeval Catholic thinker. It was only the later developments of Protestantism, in their more liberal phases, which gave rise in the second half of the 17th century and early part of the 18th century to the great spiritual impetus underlying modern science.¹

¹ Butterfield says: "When Copernicus's work first appeared it provoked religious objections, especially on Biblical grounds, and since the Protestants were the party particularly inclined to what was called Bibliolatry, some scathing condemnations very soon appeared from their side—for example, from Luther and Melancthon personally. . . . The prejudice long remained with the Protestants. . . . On the other hand, Copernicus was a canon in the Roman Catholic Church and high dignitaries of that Church were associated with the publication of his book. . . . At a later stage the resistance to the Copernican hypothesis was common to both Roman Catholics and Protestants, though in England itself it appears to have been less strong than in most other places. The Protestant astronomer, Kepler, persecuted by the Protestant Faculty at Tübingen, actually took refuge with the Jesuits in 1596. Both the Protestant, Kepler, and the Roman Catholic, Galileo, ventured into the realms of theology by addressing their co-religionists and attempting to show them that the Copernican system was consistent with a fair interpretation of the words of Scripture. . . . In the long run it was Protestantism which for semi-technical reasons had an elasticity that enabled it to make alliance with the scientific and the rationalist movements, however. That process in turn greatly altered the character of Protestantism from the closing years of the seventeenth century, and changed it into the more liberalising movement of modern times."

Op cit. pp. 48-51.

CHAPTER II

THE 17TH-CENTURY PIONEERS OF MODERN SCIENCE AND THEIR CHRISTIAN FAITH

THE presuppositions of modern science thus rest on the Christian faith; but, as we have said above, most modern scientists are completely unconscious of this fact or of the assumptions or presuppositions which they make in employing the scientific method. This is easy enough for them, buoyed up as they are by three hundred years of successful scientific research; but if the pioneers of modern science in the 16th and 17th centuries made these assumptions, they must have been aware that they were doing so. We must therefore inquire whether they deduced these assumptions from the Christian faith and whether in fact they themselves held this faith with conviction; and also whether it was from this faith that they derived the inspiration which impelled them to undertake scientific research. It is a question not only of particular individuals, but also of the intellectual climate in which these individuals grew up; and it can hardly be denied that, whatever their shortcomings and bigotry, the 16th and 17th centuries were periods of great religious conviction and zeal.

In the 16th century the turmoil of the Reformation caused religious issues and religious beliefs to assume a position of primary importance in contemporary life; while in the 17th century the controversies between Puritans and High Churchmen in England and Scotland, and similar controversies on the Continent, show by their very intensity the keenness with which Christian beliefs were held at this time. Monsieur Etienne Gilson has demonstrated to what a large extent the philosophy of Descartes was derived from the Christian teaching he had imbibed in his youth and the mediaeval Thomist philosophers who preceded

him.¹ Of the earlier pioneers Copernicus was a devout Canon of the Roman Church; Galileo, though he ultimately came into conflict with the ecclesiastical authorities, was convinced that in his work he was glorifying God; and Kepler was an intensely earnest Christian and even a mystic. But we can perhaps most clearly show evidence on this matter by confining our consideration to the pioneers of science in England, a procedure which is the more justifiable in view of the fact that in the 17th century it was in England above everywhere else that the foundations of modern science were most securely laid, notably by that splendid galaxy of physical scientists of whom the brightest star was Sir Isaac Newton.²

In point of historical fact, those who at this time laid the foundations of modern natural science in England were almost all men of quite exceptional and outstanding religious faith and Christian enthusiasm. One of the most notable, both from the scientific and the religious point of view, was Robert Boyle, famous for his discoveries both in chemistry and physics, who is said to have been amusingly described upon his tombstone in Ireland as "The Father of Chemistry and the Uncle of the Earl of Cork". He was a man of the most magnificent Christian faith and exemplary life.³ It was noted by his contemporaries that whenever he mentioned the name of God or Christ in his casual conversation, he always stopped and bowed his head.⁴ He himself stated that he would have liked to enter the ministry of the Church of England had it

¹ Etienne Gilson, *Etudes sur le rôle de la pensée médiévale dans la formation du système cartésien* (J. Vrin, Paris, 1930).

² We agree with C. E. Raven's protest in his *Science and Religion* (Cambridge University Press, 1953) against the assumption that the only important scientific pioneers in the 16th and 17th centuries were physicists and astronomers, or that their influence was necessarily the most important or beneficial in the history of science.

³ Cf. L. T. More, *The Life and Works of the Hon. Robert Boyle* (Oxford University Press, 1944). Also "A Sermon preached at the Funeral of the Hon. Robert Boyle", by Gilbert Burnet, Lord Bishop of Sarum: London, 1692.

⁴ "He had the profoundest veneration for the great God of Heaven and Earth that I have ever observed in any person. . . . The very Name of God was never mentioned by him without a Pause and a visible stop in his Discourse, in which one that knew him most particularly above twenty years has told me he was so exact, that he does not remember to have observed him once fail in it." Gilbert Burnet, Funeral Sermon (*op. cit.*).

not been that he was so strongly aware of his own unworthiness for so exalted an office—though, in fact, few men can ever have been less unworthy. Robert Boyle wrote considerably more about the Bible and the Christian faith than he ever wrote about science. His character was that of a truly conscientious Christian gentleman and his writings display the strength and vigour of his Christian faith. Associated with him was Isaac Barrow, Master of Trinity College, Cambridge, and Canon of Salisbury Cathedral. Barrow was the tutor of Isaac Newton and one of the pioneers of mathematical physics, and his work in this sphere was of fundamental importance. But he was also one of the greatest Christian preachers of his day, and the volume of his sermons and his works on the Christian faith far exceeds that of his scientific writings. His sermons are distinguished by their Christian conviction and integrity and no one who reads them can doubt that the man who could preach such sermons would have an unshakeable belief in the Christian doctrines concerning the natural world. For a time Isaac Barrow resided in Salisbury as Chaplain to his friend and colleague, Seth Ward, formerly Savilian Professor of Astronomy in the University of Oxford, and, like Boyle and Barrow, one of the founder members of the Royal Society. Seth Ward also was a man of real Christian conviction and piety, whose greatness as Bishop of Salisbury is only now being revealed through recent research into his life; and, being a great mathematician and astronomer, he was not unnaturally a friend of Isaac Newton, whom he in fact proposed for fellowship of the Royal Society. [Isaac Newton, like the others of whom we have spoken, wrote more upon the Bible and the Christian faith than he ever wrote on physical or mathematical science, a fact which is not generally realized.] He had strange views on some of the books of the Bible, particularly the Book of Revelation, and theologically veered towards Arianism; but although his Christianity may have been of a somewhat unorthodox type, it was nevertheless held with profound conviction. In regard to those doctrines of the Christian faith which have direct bearing on one's view of the natural world Newton was a most fervent believer.

These examples among outstanding physicists can be matched on the biological side. In his great book on John Ray,¹ Canon C. E. Raven has shown that this supreme pioneer of modern biology and nature study was, like Robert Boyle, "a saint of God". Like Seth Ward and Isaac Barrow he was an Anglican parson, and all his works show clearly the depth and firmness of his Christian faith. Among those who had preceded him in the field of biological science was William Turner,² first pioneer of scientific nomenclature in biology, who, like Ray, was an evangelical clergyman of the Church of England, and a man of extraordinary sincerity and uprightness of character, combined with vehement Christian faith. These examples, to which innumerable others could be added, show that historical fact supports the contention which we have been putting forward. Those who first began to study the natural world by the methods of modern science were indeed men of strong Christian faith and conviction to whom it came naturally and spontaneously to adopt that view of the world of nature which is implied by the Christian faith and required by modern science. But in addition there can be no doubt whatever in the mind of anyone who reads their writings that these men derived the impetus and inspiration which impelled them to undertake their scientific studies directly from their Christian faith. John Ray's great book of natural study is entitled, very significantly, *The Wisdom of God manifested in the Works of the Creation*,³ and this very title clearly demonstrates the attitude adopted by such men as Ray in undertaking their scientific work. They approached the world of nature with reverence, respect and love, because they had so great a devotion to the God Whose handiwork they saw in the works of His Creation around them. This source of inspiration is by no means confined to the scientists of the 17th century. It is the root of that succession of religious men, who have in the same spirit devoted themselves to the observation of nature, which is characteristic of England

¹ C. E. Raven, *John Ray, Naturalist* (Cambridge University Press, 1942).

² C. E. Raven, *English Naturalists from Neckam to Ray* (Cambridge University Press, 1947).

³ London, 4th edition, 1704.

from the 16th century to the 20th. Perhaps the best known of all these is Gilbert White, author of *The Natural History of Selborne*, but there are many others. In the 18th century, for instance, there is Stephen Hales (1677-1761), called the Father of Physiology, who was for 52 years Vicar of Teddington. In the early part of the 19th century lived John S. Henslow, Professor of Mineralogy and later of Botany at Cambridge, who was Rector of Hitchin. Another early 19th century Botanist was Miles Berkeley (1803-1889), who again was an Anglican clergyman. Indeed investigation would show that the number of Christians of this type, whose enthusiastic interest in science was a direct product of their Christian faith, was very large indeed. In a recent article in *Theology*¹ the author mentions three such Wiltshire parsons of the 19th century, of whom one, Arthur Philip Morres (1835-1900), was a naturalist known to ornithologists and entomologists throughout the country, of whom his niece said, "All nature was in his heart". Examples of clergymen who were pioneers of the science of Geology are Dean Buckland, Canon Adam Sedgwick, Dean Conybeare, Dr. William Whewell, the Rev. William Gregor, discoverer of titanium, and Canon T. G. Bonney; and another great Christian among early geologists was Hugh Miller.

But it would be a great mistake to suppose that such a Christian interest in nature was confined to the ranks of the clergy, or that it was only the 17th century pioneers of science who were distinguished for their religious conviction. We know that in the 18th century Joseph Priestley, the first English discoverer of oxygen, a Unitarian, was a profoundly religious man; while in the 19th century Michael Faraday, perhaps the greatest physical scientist of the century, was a devout member of a small evangelical sect. His biographer, Spence Jones, records how, when Faraday was at the very height of his international fame, a friend of his, passing by chance a small chapel, was surprised to see that the preacher was Professor Faraday and, on entering, heard the world-famous scientist delivering a simple address

¹ *Theology*, September, 1951, pp. 329-335.

² *Min. Mag.* Vol. XXX, June 1955, p. 67.

on the Love of God. Similarly, Clerk Maxwell, the discoverer of the dynamical theory of gases and the electro-magnetic theory of light, was a profound Christian, as was also John Dalton, the founder of the modern atomic theory, who was a Quaker.

Nor did this tradition end with the 19th century. Lady Thomson, in the biography of her husband, Sir J. J. Thomson, the discoverer of the electron, tells us that he was accustomed, before retiring to bed, to read his Bible and pray for a quarter of an hour every night. In fact, among modern scientists there have been many who were distinguished for their Christian faith. An eminent example was Sir Arthur Eddington, a most active and convinced Quaker, Sir William Bragg, and many others. The present writer was admitted a Fellow of the Chemical Society by Professor W. P. Wynn, then President of the Society, of whom his biographer in *The Journal of the Chemical Society* states, "Living during a period when science and religion were in conflict, he retained sincere religious convictions." It is also perhaps worth stating that when the present writer was a student at the Royal College of Science, London, there were among the Professors at that time one, a physical chemist, who was a keen Presbyterian, another, a physicist, who was a very active Baptist, another, an organic chemist, who was a devout Anglo-Catholic, another, a geologist, who was a vigorous member and churchwarden of his parish church, and a zoologist who was an Anglican Modernist. It is a popular delusion to suppose that the vast majority of scientific men today are atheists. Personal acquaintance with scientists in many fields entitles the present writer to state that probably 50% of these scientists were practising and convinced Christians whose Christian convictions afforded one at any rate of the sources of their scientific enthusiasm. It has often been remarked that one of the factors which leads men to study the world of nature is curiosity, and, indeed, it is questionable whether anyone can be a good research scientist without a sense of wonder and curiosity. But curiosity which arises from an interest kindled by affection, respect and love for the Author of all nature is surely

more enduring and more invigorating than curiosity which is mere idle curiosity.

We have confined our survey of the religious faith of scientific pioneers to England, but had we looked at a wider field we should have been able to include men like Pasteur in France, whose Christian faith was, as is well known, the origin of his scientific activity; Abbé Mendel in Germany, whose researches laid the foundations of the modern science of genetics; and many others.

It may also be noted that Christian inspiration as an incentive to the study of the natural world had been known long before the periods of which we have been speaking. Robert Grosseteste, Bishop of Lincoln, was perhaps the earliest notable pioneer in this field. His own practical work was probably small, though recent investigations at Oxford have indicated that it was greater than was at one time supposed.¹ But he laid the foundations of the philosophical background of science and was spoken of by Roger Bacon, another early religious pioneer of science, in the well-known phrase, "One man, our Lord Robert, knew the sciences." It would now seem that some of the pioneer work formerly attributed to Roger Bacon should justly be credited to Robert Grosseteste; and it is interesting to note that this beginning of scientific interest in the natural world was developed by three successive members of the Franciscan order in England—Grosseteste, Bacon and Bartholomaeus Anglicus, whose great book, *De Proprietatibus Rerum*, covers a remarkably large part of the realm of nature.

To adduce a volume of evidence sufficient to prove the assertion that the great founders of modern science in the 16th and 17th centuries were for the most part convinced Christians who were actuated by their Christian faith would require a very large amount of space. All that we have been able to do here is to give a very few typical examples; but it is hoped that even these few examples will be sufficient to indicate that the historical evidence supports our contention that the fundamental source of their scientific inspiration,

¹ A. C. Crombie, *Robert Grosseteste and the Origins of Experimental Science* (Oxford University Press, 1953).

and of the assumptions required before the natural world could be studied scientifically, was their Christian faith.)

In view of this it may seem strange and paradoxical that the ultimate influence and effect of the 17th-century scientific movement was to provoke an attitude of "deism", scepticism, and even atheism, in the following century. This fact has given rise to a general impression that the scientific movement was from its beginning in the 16th and 17th centuries a revolt against religion, and against the Christian faith in particular, and that the scientific pioneers themselves were hostile to Christianity. But in reality the very reverse was the case. As we have seen, these pioneers were almost all men of profound Christian faith, who firmly believed that their studies were "to the glory of God" and would help to establish more decisively the Christian religion and reveal the power of God and the wonders of His Creation. A negative, sceptical, materialistic "twist" and interpretation was given to the ideas and discoveries of science not by the scientists themselves, but by their literary "interpreters", the "litterateurs" and "philosophes", especially of France; and the secularisation of the 18th century was the result not only of the scientific movement but of many other influences. In philosophy John Locke and David Hume contributed to it; the revulsion from Puritanism and from the fierce religious conflicts of the 16th and 17th centuries played its part; the rise of the "city-state" and of urban civilization assisted it, as it had done earlier in Renaissance Italy. Moreover, the spread of travel and the discovery and exploration of foreign lands and primitive peoples which led to the production of many books recording such journeys, introduced a knowledge of other religions and cultures which at first aroused doubts as to the validity, or at least the uniqueness, of the Christian revelation, and so fostered deism. Professor H. Butterfield emphasises that the secularisation of the 18th century cannot be attributed to the scientific pioneers of the 16th. "Many of the scientists of the seventeenth century had been pious Protestants and Catholics, and in this very period both Robert Boyle and Isaac Newton showed considerable fervour concerning their Christianity—even

Descartes had thought that his work would serve the cause of religion. . . . A scepticism which really had a literary genealogy combined to give to the results of the seventeenth-century scientific movement a bias which was rarely to be seen in the scientists themselves and which Descartes would have repudiated. . . . In this connection it is important to note that the great movement of the eighteenth century was a literary one—it was not the new discoveries of science in that epoch but, rather, the French *philosophe* movement that decided the next turn in the story and determined the course Western civilisation was to take.”¹

¹ *Op cit.* p. 150.

CHAPTER III

CHRISTIAN VIRTUES AND THE ATTRIBUTES OF A GOOD RESEARCH SCIENTIST

A FURTHER interesting piece of evidence of the close spiritual affinity between science and the Christian religion can be found by considering those attributes which are essential in a good research scientist. The first is quite obviously *intellectual integrity* and *respect for truth*; this is, and always has been recognized as, a fundamental Christian virtue. In speaking of truth in this sense we are not discussing the vexed question of whether and in what sense science is primarily a search for abstract truth: we are thinking of something much more simple and practical, namely the fact that no scientist can perform experiments of the requisite degree of accuracy and obtain results which will be accepted and respected by his fellow scientists unless he has complete *impartiality*, *fair-mindedness* and *lack of prejudice*. In considering the value of the work of a fellow-scientist, for example, a research worker must not allow himself to be prejudiced or biased by any personal likes or dislikes, nor in carrying out his own work must he allow himself to be influenced by personal considerations. He must be absolutely *just*. He must not primarily seek to prove or support his own theories or ideas, nor to bolster up a preconceived or abstract system of thought. The research scientist's primary objective is not to justify an idea, but with absolute impartiality and thoroughness to collect accurate information and ascertain facts. In other words, he must bow himself in intellectual humility before the facts of the natural world, as Sir Lawrence Bragg has finely pointed out. Such *intellectual humility*, the readiness to recognize his own ignorance and to stand corrected by the facts, is an example, and by no means an unimportant one, of the fundamental Christian virtue of Humility.

On the other hand, to display such impartiality, to be ready to discover, recognize and publish, without attempting to hide or distort them, facts which may destroy cherished theories, or even disprove and bring to nought the research of a life-time, requires a very high degree of mental and intellectual *courage*.

Nor is it only intellectual courage that is required of the research scientist. It is well known how many of the pioneers of X-Rays and Radio-Activity either lost their lives or suffered grave injury through exposure to harmful radiations. Many chemists and others habitually carry out experiments which endanger their life or health, while physiologists and medical research workers are prepared to be their own "guinea-pigs", even though this may involve the very gravest risks to life and health. Courage, therefore, of both types is a characteristic required in any first-class research worker, and courage is a virtue frequently and emphatically preached both in the Old Testament and in the New.

Again, in the choice whether to serve God or Mammon, it cannot be argued that first-class research scientists are addicted to the service of Mammon; for no man can be really successful in the work of scientific research unless he is prepared to devote time, convenience and money to his labours, and to forgo a great deal of worldly pleasure which others regard as their due. There are many fields of scientific research in which a worker must be prepared to shut himself away from all ordinary social contacts and all pleasures and relaxations for a considerable time. To take a simple example from the present author's own experience: there are many operations in analytical chemistry, particularly in the analysis of rocks and minerals, in which, once a particular operation has been begun, it cannot possibly be interrupted until it is concluded. These operations may last for ten or even twelve hours, if not longer, and it is often impossible to say how long such an operation will take. Once it is started, the worker must be prepared to finish it, no matter if this involves cancelling some attractive social engagement. One cannot do successful scientific research unless one is prepared to give it first place. The scientist who imagines that he can

confine his work to an eight-hour day and be certain of his golf every Saturday is never likely to be successful and is usually spoken of with some little contempt by his fellow-scientists. Such *single-minded devotion to one's vocation, such self-sacrifice and unselfishness*, as is essential in a good research scientist, is very certainly a truly Christian virtue; while the *patience* and *self-control* needed in much scientific work are also typical Christian principles.

Moreover, this unselfishness takes, in modern science, another pronounced form. In earlier ages nearly all scientific research was carried out either by an individual scientist alone or by not more than two or three scientists working together; but, owing to the development and enlarged scale of modern scientific research and modern laboratory equipment and technique, it is more and more the case that all important scientific research is carried out by teams of workers. These teams can never be successful unless those who compose them think of their work and not of themselves. A scientist who is concerned with his own personal reputation and the fame or success he himself will get out of such a team experiment, is never likely to be a successful or efficient member of any research team. Such research work, therefore, develops on a very high level the team spirit and *sense of brotherhood* which are held by Christianity to be among the highest virtues.

This unselfishness and fellowship extends outside the members of a particular team. A scientist can always be assured of friendship and generous help and collaboration from any other scientist whom he wishes to approach. Again, perhaps a personal experience can illustrate this. The present author was at one time engaged for a short period in investigation of a specimen of the mineral *epidote*, which showed a strange aberration in connection with its water content. Having first performed the requisite analyses himself, he obtained the assistance of a more experienced fellow analyst to check his results. When this shed no further light on the problem, he consulted a spectroscopic expert, who at once performed a spectroscopic investigation of the mineral, entirely free of charge. This still giving no key to the problem,

he consulted the authorities at the Natural History Museum, one of whom took X-Ray photographs of the crystal structure of the mineral, again without any charge. Finally, when all these investigations had only served to confirm the aberration, he communicated with Sir Lawrence Bragg, who put him in touch with a worker in his own laboratory who was at that time investigating the atomic structure of epidote. This worker at once gave freely and readily all the information he had so far obtained. This example of readiness to give time and knowledge to the service of a fellow-scientist is an excellent illustration of the spirit of friendship and brotherhood which characterises scientific research workers.

Finally, this spirit extends beyond national boundaries. Scientists habitually exchange information and collaborate with those of other nationalities. International congresses are frequently held and on these occasions national rivalries disappear in a common devotion to science. Free, untrammelled and unrestricted publication of scientific results and the exchange of knowledge between those of different nationalities is characteristic of modern science and essential to its wellbeing.

Thus, it appears that the virtues taught by Christianity are in many cases precisely those necessarily inculcated by the practice of scientific research, and this can hardly be fortuitous.¹ It is not suggested that every research scientist is a saint or a perfect man. What is suggested is that the more he displays these Christian virtues, the better research scientist he will be.²

¹ Cf. A. D. Ritchie: "That the virtues of the man of science as he has appeared in Western Europe are just Christian virtues is perhaps not so obvious. These virtues, belief in free discussion, tolerance and equal treatment of others, all spring from respect for persons and cannot exist without that respect. . . . If Western Europeans have practised these or any of the more difficult virtues at any time it has been in consequence of Christian teaching and example." *Civilization, Science and Religion*, pp. 168-169.

² For a brief summary of Christian values in modern science see Mary B. Hesse, *Science and the Human Imagination*, p. 162.

CHAPTER IV

THE OBJECTS OF SCIENTIFIC RESEARCH AND THE USE OF SCIENTIFIC DISCOVERIES¹

IN the preceding chapters it has been indicated that from the Christian point of view the primary objective of a scientist is the investigation of "the wisdom of God manifested in the works of the Creation"; and we have seen, especially in Chapter II, that in fact this was believed by the Christian scientific pioneers of the 17th century to be the main aim of their work. Even in the case of those who are less conscious of the handiwork of God in the world of nature, one of the chief incentives which lead them to become research scientists is a child-like wonder and curiosity concerning the natural world and its processes. This has also been expressed by saying that the fundamental object of science is "the search for truth", where the word "truth" is defined as meaning "true knowledge about the natural world". Such an aim is in itself surely a very worthy one, and if it arises from the religious motive already mentioned, it is an aim which must commend itself very highly to all sincere Christian people.² The attitude of mind of one who studies nature in this way is admirably expressed in the 43rd chapter of the Book of Ecclesiasticus, while in the 7th chapter of the Book of Wisdom such knowledge of nature is said to be given by God: "For himself gave me an unerring knowledge of the things that are, To know the constitution of the world, and the operation of the elements; The beginning and end and middle of times, The alternations of the solstices and the changes of seasons, The circuits of years and the positions of stars; The natures of living creatures and the ragings of wild

¹ For further discussion of the questions mentioned in this chapter, see F. B. Welbourn, *Science and Humanity* (S.C.M. Press, 1948).

² For a statement of this, see A. Wood, *In Pursuit of Truth* (S.C.M. Press, 1927).

beasts, The violences of winds and the thoughts of men, The diversities of plants and the virtues of roots: All things that are either secret or manifest I learned, For she that is the artificer of all things taught me, even wisdom."

Yet, in spite of its spiritual value and intellectual satisfaction, such knowledge may be sterile if divorced from humanity; and scientific research based completely and entirely upon the "search for truth" and abstract knowledge concerning the world of nature may be in danger of becoming arid and "academic". An attitude of philosophic detachment, and aloof intellectual superiority to practical utility, can hardly be reconciled with the Christian duty to "have a concern for" the physical welfare and betterment of one's fellow men. Although Christ Himself sternly rejected the idea of using material means to bribe mankind into accepting His spiritual teaching, yet on the other hand He showed every consideration for their physical health and material well-being. He did not hesitate, in addition to teaching and preaching, to ensure that people were provided with food when they would otherwise have been overcome with faintness, and He spent a considerable part of His Ministry in healing the sick and combating disease.

Similarly, it is not wrong for a scientist to regard as one of the objects of his research the discovery of knowledge which will be practically useful and beneficial to mankind. The desire to serve one's fellow-men and to increase their control of the forces of nature or of the causes of disease is a very proper inspiration for a scientist. This second object of science—to discover knowledge not only for its own sake but because it can be employed for the benefit and increased happiness of mankind—is, like the first object, in complete harmony with Christian principles. Love and care for one's neighbour is second only to love for God and His Creation as the supreme Christian duty. Humanitarian motives for scientific research are just as proper and respectable as purely intellectual ones. Applied science should not therefore be regarded merely as a degraded form of pure science. Looking again at the 17th century, it is interesting to note that both these objects of science—the investigation of nature in order to satisfy our

reverent curiosity concerning natural phenomena, and the desire to obtain knowledge concerning nature which may be of practical benefit to our fellow men—are clearly set out in the original Charter of the Royal Society by those who founded it.

A question arises, however, how far this second objective ought to dominate the mind of the scientist and the directing of scientific research. It has been argued, particularly by Marxist scientists such as Professor J. D. Bernal, Dr. Joseph Needham, and Professor J. B. S. Haldane, that all scientific research should be definitely and deliberately planned so that research work is concentrated upon such branches of knowledge and such aspects of the natural world as are likely to yield results of practical application and benefit to the well-being of mankind. Thus, utility becomes the final test of the value of scientific work.

On the other hand, other scientists, such as Dr. J. R. Baker of Oxford¹ and Professor Michael Polanyi² have argued strongly for the vital importance of freedom in scientific research, pointing out not only that the primary object of science must be the pursuit of truth concerning nature for its own sake, but also that if every scientist is to be allowed only to undertake work on such problems as are allotted to him by the State or the Party, or even the Managing Director of a Company or Corporation, the natural instinct of scientific curiosity, the necessary intellectual integrity which impels us to follow truth wherever it leads, and the intellectual freedom essential to the scientist, will be jeopardized or destroyed. It is perfectly true, as has already been indicated, that the complexity of modern scientific research necessitates its being carried on by groups of scientific workers in collaboration, and some element of planning is inevitable to ensure proper co-ordination between the various members of the group. Even in a University laboratory it is part of the work of the Professor or Director to discuss with the research worker what is to be the subject of his research

¹ J. R. Baker, *The Scientific Life* (Allen & Unwin, 1942); and *Science and the Planned State* (Allen & Unwin, 1945).

² M. Polanyi, *Science, Faith and Society* (Oxford University Press, 1946).

and to take care that it is properly co-ordinated with the work being carried out elsewhere in the same field. But this is very different from arguing that all scientific research must be rigidly "planned", or that the final test and objective of research must be its practical usefulness from a human point of view.

Bound up with this is the fact that if natural objects (the soil, plants, trees, animals) are regarded solely as material objects existing for man's selfish use, to be bullied, over-worked, or treated as mere tools and means to selfish human ends and profit, this is a complete denial of the fundamental Christian attitude towards God's Creation. Wherever natural things are treated in this utilitarian way they are degraded from their proper status, and the consequences of this misuse will in the long run be disastrous. Modern agriculture shows many examples of this tendency, and we may note the evidence that has been offered of the deleterious effect upon hens of the use of egg-batteries. Thus, we may say that the Christian conception of the purpose of science, while emphatically recognizing the importance of the practical applications of knowledge and of the well-being of humanity, also stresses the importance and value of nature in itself, and indicates how essential it is that the forces and creatures of nature should be treated with respect and reverence as having value in and for themselves, because they are the work of God.

There is no doubt that the ruthless and cynically selfish use of natural objects has led to fatal consequences. For example, where men have misused the soil and the surface of the earth for their own selfish gain or a quick profit, treating it without respect and with no thought for the health of the soil and the welfare of future generations, the result has been the desolation of vast areas of land and the production of new deserts like the "Dust Bowl" in America. It is probable that large areas of the Sahara Desert were once fertile tracts which have been reduced to their present condition because men used the soil solely for their own benefit without reverence or care for its future well-being. The maltreatment of the soil, without proper respect for it,

without proper rest or re-afforestation, has begun seriously to deplete our food resources. It is sinful, contrary to God's will and purpose, and an insult to His Creation. In addition it shows callous selfishness towards mankind and future generations. Thus, too narrow a definition of this second object of scientific research is deplorable. But if it be defined in a Christian way, it is perfectly reconcilable with the first object and a worthy aim of science. Professor Leonard Hodgson, in his Inaugural Address as Regius Professor of Divinity in the University of Oxford,¹ very wisely pointed out that the conflict between these two views rests upon a false antithesis, and the synthesis may be found in the Christian ethic, which, as already indicated, holds both objectives to be good and legitimate aims of scientific research. When the aim of practical utility and the need for planning are over-stressed, especially from Marxist motives, Dr. Baker and Professor Polanyi are rightly distrustful of the effect of political considerations and economic theories as a source of prejudice and bias, hostile to that impartiality which is, as we have already seen, essential to the well-being and very existence of scientific research. Professor Polanyi, especially, with practical experience of the effects of such political considerations in Central Europe, has rightly defended the integrity of scientific judgement against such influences. On the other hand, Dr. Joseph Needham, in several essays in *Time, the Refreshing River*,² has insisted on the need for considering science in relation to the well-being of humanity, rather than from an "ivory tower" of philosophic detachment. As we have said, the research scientist who derives his zest for his work primarily from the thought that it may bring benefit to humanity cannot be held to be any less Christian than the research scientist whose enthusiasm is based upon intellectual curiosity; but it must be admitted that the Communist materialistic conception of the aims of science is open to grave objections.³

¹ Leonard Hodgson, *Theology in an Age of Science*, pp. 7, 8 (Oxford University Press, 1944).

² J. Needham, *Time, the Refreshing River* (Allen & Unwin, 1943).

³ See Appendix B.

We cannot, however, consider the usefulness of scientific knowledge without facing the question, How are we to decide what use is to be made of the results of scientific research? Professor J. D. Bernal and others have rightly pointed out that the scientist cannot remain uninterested in the question of the use that is to be made of the results of his research. The most outstanding example of this has recently been provided by the discovery of the means of liberating the terrific force of atomic nuclear energy. This discovery has given enormous power to men. Its ultimate benefit may be very great. It may provide an essential source of energy, enabling our civilization to continue when other sources are exhausted. It has already brought great benefits to medicine and to industry. But it has released the threat of unprecedented violence, with the possible destruction of millions of lives and of the accumulated treasures, moral and material, of civilization. The whole world lives in fear of the devastating consequences of the destructive use of this energy, and no scientist can remain uninterested in the application to be made of it.¹

Professor Bernal, in his book *The Social Function of Science*,² examines the misuse of science under existing conditions; and although one may have to make some allowance for his strong Marxist principles, it remains true, as he points out, that there is a widespread feeling of frustration among scientists, because they see their work hampered or curtailed by purely financial, commercial, and selfish considerations. Again, the knowledge that discoveries which they have made and which could be of benefit to humanity are being used instead for its destruction is frustrating and infuriating to research scientists. Thus, while it is not suggested that the scientist is necessarily any wiser or more qualified than other human beings to determine the use to be made of scientific knowledge, he is very naturally keenly interested in this question, and, as C. H. Waddington contends, the "habits of scientific thought" may help him to see the issues more

¹ For a dramatic treatment of this theme see Charles Morgan, *The Burning Glass* (Macmillan, 1953).

² J. D. Bernal, *The Social Function of Science* (George Routledge, 1939).

clearly. He is, too, properly resentful if those responsible for the control either of national or international policy, or of commercial and industrial scientific and engineering enterprises, prostitute to mercenary, selfish, or warlike ends the fruits of scientific research. Such a sense of frustration on the part of scientists accounts for the fact that many of the younger scientists of today, for example in the Association of Scientific Workers, are inclined to accept the doctrines of Communism. Communism, at any rate in theory, attempts to ensure that the results of scientific discovery and invention shall be utilized rather than repressed, and used for the general benefit of the community. (See Appendix B.)

Yet the question, By what principles are we to be guided in deciding how the results of scientific research are to be used? is not in itself a question which can be decided by the methods or from the data of science. Professor C. H. Waddington and Dr. Julian Huxley have lately suggested that we can obtain from the study of the direction or principles of biological evolution a set of moral standards and principles, for guidance as to the right way of applying scientific knowledge. This contention will be further discussed in a later section of the book,¹ but it may be said that there are many cases which simply cannot be decided by a scrutiny of factors involved in the evolutionary process.

The whole question of how we are to decide on the use to be made of scientific knowledge has been discussed by Professor A. V. Hill in his Presidential Address to the British Association in September, 1952. He pointed out that science in itself is strictly neutral, in so far as ethical judgements are concerned. In the process of scientific experiment and inquiry all outside factors, bias, and prejudices must be rigidly excluded. Judgements of value must never be allowed to affect judgements of fact. The new physical power discovered through the work of scientists is in itself morally neutral until some human will decides how it shall be applied, whether for human preservation or human destruction. Science brings knowledge and knowledge is power, and power is inseparable from moral responsibility. In his

¹ See p. 133.

Presidential Address to the British Association in 1951 H.R.H. The Duke of Edinburgh said, "It is clearly our duty as citizens to see that science is used for the benefit of mankind; for of what use is science if man does not survive?" Professor Hill has asked, How can we discharge this duty? How can we know how to use science for the benefit of mankind? This is a moral and religious and not a scientific question, and can only be decided upon moral and religious principles.

Mankind requires the wise guidance and spiritual truth of the Christian faith and Christian revelation in order that it may make proper and constructive use of the results of scientific research. The scientist himself, as much as any other citizen, is concerned with this problem, but his scientific knowledge in itself will not help him to solve it. It is true, as Professor A. V. Hill has said, that "scientific research has opened up the possibility of unprecedented good or unlimited harm for mankind, but the use that is made of it depends in the end on the moral judgements of the whole community of men. It is totally impossible now to reverse the process of discovery. It will certainly go on. To help to guide its use aright is not a scientific dilemma, but the honourable compelling duty of a good citizen"; and in reply to this speech the Duke of Edinburgh said that this duty could only be carried out on Christian principles, and that Christian standards should govern the thoughts and actions of the community at large.

The fear of scientific advances which is present in many people's minds is not really caused by what has been discovered but by apprehension that the moral development and spiritual condition of mankind is not adequate to enable them to use and apply this scientific knowledge wisely. But the Christian will recognize that this failure to use the fruits of scientific research so that they become of real benefit to mankind is not due merely to a lack of moral and ethical understanding, but much more to an inherent weakness and distortion in the spiritual nature and character of men, to which the Christian gives the name, "Original Sin". The reasons why scientific discoveries are not used for the betterment of the human race are, in almost every case, human

selfishness, human jealousy, human greed, human pride, and human distrust. As we have already said, in the commercial sphere scientific knowledge is often either ignored or suppressed or misused because the dissemination and application of it, while unquestionably beneficial to mankind as a whole, would be detrimental to the selfish, financial, and material interests and profits of the company concerned, or useful to its rivals.

On the other hand, the most serious misuse of science today arises from the application for purposes of war and destruction of physical, chemical and bacteriological knowledge which could and should be applied for the well-being and benefit of humanity instead of for its terror and destruction. But if we consider why nations wage war, we are driven to recognize that they usually do so either from selfishness or from vanity or from greed. Thus, the fact that scientific advances have frequently caused devastation to the world is clearly due to such sinful tendencies in human nature. If the results of science are to be constructively and wisely used, it is not sufficient that men should know how they should be used; it is also essential that they should have such spiritual strength as will enable them both individually and on the national level to overcome these powerful innate sinful tendencies, and to obey what the Christian religion clearly declares to be their moral and spiritual duty. Such spiritual strength cannot come from unaided human nature itself, since it is so affected and distorted by this inherent weakness that it has no strength to overcome its own sinfulness.

Some modern scientists or scientific writers have suggested that the salvation of mankind can be achieved through the increase of knowledge; but, in fact, knowledge can never save, and those who begin by believing in salvation through knowledge often end by becoming disillusioned and embittered. The only hope of salvation or of survival for mankind and for the world lies in a recognition of their moral

Note : An impressive warning of the permanent and world-wide devastation of life likely to be caused by the use of the Hydrogen Bomb, and a call to all nations and parties to settle their differences by discussion, and to abandon war, was issued by eight famous scientists in July 1955. These scientists rightly used their special knowledge to warn their fellow men, and thus discharged their proper responsibility. All Christians must heed their call.

weakness on the part of men, and a readiness to throw themselves upon the mercy of God and open their minds and spirits to the strength and influence and power of his Grace.

NOTE

Professor A. V. Hill, in his address to the British Association in 1952 mentioned above, set out the problem which, he rightly considered, presented the most difficult question for moral decision at the present time. If science, especially medical science, recognizes any central obligation, it is that life must be preserved at all costs, without regard to circumstances. "All the impulses of decent humanity, all the dictates of religion, and all the traditions of medicine insist that suffering should be relieved, curable disease cured, preventable disease prevented. In many parts of the world advances in public health, improved sanitation, the avoidance of epidemics, the lowering of infantile death rates, and a prolongation of life have led to a vast increase of population. For many years to come the shortage of natural resources, particularly of food, is bound to produce increasing deprivation and disturbance. There is danger that this will result in the over-use of natural resources and the desolation of the soil, leading to permanent and irretrievable loss. Suppose now it were certain that the pressure of increasing population, uncontrolled by disease, would lead not only to widespread exhaustion of the soil and other capital resources, but also to continuing and increasing international tension and disorder, making it hard for civilization itself to survive, would the majority of humane and reasonable people change their minds? If ethical principles deny our right to do evil that good may come, are we justified in doing good when the foreseeable consequence is evil?"

Professor Hill has here challenged us to consider a particular problem and we ought to accept the challenge and examine the light shed upon it by the application of Christian principles. First, then, we can say that we must do what is good, even though we may think its results would produce evil. In this particular case we must use every resource of chemical and medical science to relieve suffering and prevent

or cure disease. Our Lord Himself constantly did this, and spent a great part of His ministry in healing and overcoming disease, which He taught was the work of the Devil. We must follow His example, and fight disease as an evil. Human life is, to the Christian, sacred; man is made in the image of God, and is destined for a life beyond time and space. Life must be revered and preserved. But it is no part of Christian conduct to imitate the ostrich, or refuse to face unpleasant facts or consequences, or to behave irresponsibly. We must recognize the truth of what Professor Hill says. The result of applying all scientific and medical resources to overcome disease and prolong life will inevitably produce within a few years such a tremendous increase in population that mankind will be brought to the verge of starvation. It is true that scientific methods of agriculture, and the opening of new areas of the world previously not able to be cultivated on account of malaria, will result in some increase of food production; but it seems clear that this will only go a short way to counteract the increased needs of mankind. The result of acute shortage of food resources is almost inevitably war or strife. If we say that disease must be prevented and life prolonged, how, on Christian principles, are we going to avoid these evil consequences?

Firstly, we must insist on that wise and proper use of the soil and the surface of the earth and that respect and reverence for God's creatures to which we have referred above. If men will adopt the Christian attitude to nature, they will not destroy the natural resources of the earth by selfishness and sinful misuse of them. Professor Hill insisted in his address that friendliness, frankness, and equality among nations were essential to the preservation of scientific research, and these are also Christian principles necessary for the solution of such a problem as we are considering. Nations must collaborate together and plan wisely and generously to overcome the threat of famine. So far such collaboration and good will, required by Christian principles, has been largely thrust aside in favour of competition, national policy and greed, extreme ideological political theories, and the out-moded futile economics still thrust upon us

by completely unscientific and un-Christian economists. Secondly, it seems clear that there must be some limitation of families. This is in no way contrary to Christian principles. Temperance, self-control, a sense of responsibility, forethought, are all Christian duties; and the idea that one should produce numerous children, without any idea of how they are to be supported or on the assumption that they must be supported by the community, is not Christian. Thoughtful, responsible people limit their families reasonably: it is only the foolish, feckless, self-indulgent or stupid who fail to realize the need for self-control and the duty not to increase disproportionately the strain on the world's resources. It is in the backward and uneducated peasantry of the East and of South America that the rate of increase is so alarming; and these are the regions most likely to be affected by famine. Christian principles of temperance and foresight would suggest that instruction on the need and means of family limitation must be taught in such areas especially. Yet Professor Hill pointed out that when a complete survey of the food resources and increasing population of India had been carried out, the learned men who produced it could not agree to recommend the teaching of family limitation to the peasants, but said, "We must leave it to God." That is certainly not the teaching of Christianity. To trust God and pray for His help is the heart of Christianity; but to use Him as an excuse for laziness and to push off one's responsibility on Him is disgraceful. St. Paul, listing the fruits of the Spirit, includes among them temperance, and says that "they that are Christ's have crucified the flesh, with the affections and lusts". Who can doubt that such a Christian state of mind, coupled with wise and co-operative planning of food production throughout the world, and a right attitude to the soil and nature, would prevent the catastrophe which would otherwise arise from the spread of modern scientific triumphs over disease?

Such is the Christian answer to the problem. It is dependent on a new spirit and attitude of mind, and brings true light into darkness, with the fruits of the Spirit—Love, Joy, Peace. But there is as yet very little sign that mankind will have the wisdom and sense to adopt it.

CHAPTER V

THE LIMITATIONS OF SCIENCE

FROM what has been said above it will be clear that the scientific method of investigating nature had its origin in Christian belief and inspiration and requires for its efficient carrying out various Christian virtues. It is therefore one of the methods which a Christian employs in considering and seeking to know the whole field of existence and reality. But it is not the only method; and it is necessary for a true understanding and agreement between Christianity and Science that the inevitable limitations of the scientific method should be recognized. To begin with, as A. D. Ritchie says, "The kind of truth we look for determines the way we look, and in science we are looking for a particular kind of truth."¹ Science is essentially the study of the material world, although in psychology and neurology it impinges upon the mental world. Thus, it will not give us information about spiritual reality nor about such things as aesthetic and moral values. These things are not within the proper scope of science and the methods of science are quite unqualified to give us information on them. Science depends upon such procedures as weighing and measuring; therefore such things as are imponderable or immeasurable cannot be identified or studied scientifically. We realize the absurdity of applying science to artistic or moral subjects if we try to speak of half a pound of beauty or two inches of courage.

Essentially, modern science is mathematical, and Descartes, its philosophical parent, deliberately divided reality into two categories, mental and material. Into the category of material things, being himself an expert mathematician, he deliberately put precisely those things which were amenable

¹ *Op. cit.* p. 43.

to mathematical treatment, and all other things he placed in the category of mind or mental objects. Similarly, in dividing the qualities of material things, he described as primary qualities precisely those things which were mathematically measurable, and as secondary qualities those things which were not capable of mathematical treatment and were therefore not a suitable subject for scientific study. Most departments of modern science, certainly the physical sciences, have followed this lead of Descartes ever since, with results which, as Professor A. N. Whitehead points out, are certainly peculiar, since it makes nature "a dull affair, soundless, scentless, colourless, merely the hurrying of material, endlessly, meaninglessly. . . . This has held its own as the guiding principle of scientific studies ever since. It is still reigning. . . . It is not only reigning, but it is without a rival. And yet—it is quite unbelievable. This conception of the universe is surely framed in terms of high abstractions, and the paradox only arises because we have mistaken our abstraction for concrete realities."¹

The consequence of such an approach to the external world is that we deliberately make a selection, paying attention only to those things which are amenable either to mathematical treatment or to classification. All scientific study of nature partakes of this process of selection, and the knowledge obtained by means of it must be partial and selective. Thus, we may say that only those things can be studied by the scientific method which are *observable by the senses* and amenable to some sort of precise measurement. Sir Arthur Eddington, in *The Philosophy of Physical Science*, writes: "If we take observation as the basis of physical science, and insist that its assertions must be verifiable by observation, we impose a selective test on the knowledge which is admitted as physical. The selection is subjective, because it depends on the sensory and intellectual equipment which is our means of acquiring observational knowledge. It is to such subjectively-selected knowledge, and to the universe which it is formulated to describe, that the

¹ *Op cit.* p. 69.

generalizations of physics—the so-called laws of nature—apply.”¹

Thus, in approaching nature by the scientific method we deliberately select material suitable for study by that method, and tacitly agree to ignore all material and all phenomena which are not suitable for observation by it. There is a part of reality which can, as it were, be caught, studied, and observed by the scientific method; and there is another part which will always elude this method. But the second part is no less real and no less important than the first. Sir Arthur Eddington explains this in one of his charming analogies. “Let us suppose,” he says, “that an ichthyologist is exploring the life of the ocean. He casts a net into the water and brings up a fishy assortment. Surveying his catch, he proceeds in the usual manner of a scientist to systematize what it reveals. He arrives at two generalizations: (i) No sea creature is less than two inches long. (ii) All sea creatures have gills. . . . An onlooker may object that the first generalization is wrong. ‘There are plenty of sea creatures under two inches long, only your net is not adapted to catch them.’ The ichthyologist dismisses this objection contemptuously. ‘Anything uncatchable by my net is *ipso facto* outside the scope of ichthyological knowledge, and is not part of the kingdom of fishes which has been defined as the theme of ichthyological knowledge. In short, what my net can’t catch isn’t fish’.”²

This delightful analogy is extraordinarily appropriate and reminds us that any method of acquiring knowledge must be limited in its scope by the means which it employs and by the facts for which it is looking. This is true of science, and when scientists forget this fact and claim that what is demonstrated by the scientific method is the only possible knowledge, their claim is foolish, and cannot but lead to protest and antagonism on the part of Christians, and others, who are well aware that much of their own knowledge, no less reliable than scientific knowledge, is derived by other methods of

¹ A. S. Eddington, *The Philosophy of Physical Science*, p. 16 (Cambridge University Press, 1939).

² *Ibid.* p. 16.

study and from other realms of experience. Thus, we are bound to reject such a statement as the following made by Bertrand Russell: "Whatever knowledge is attainable must be attainable by scientific methods; and what science cannot discover, mankind cannot know."¹

But in addition to the fact that it must necessarily select only that material which is amenable to scientific or mathematical treatment, i.e. only things which can be weighed or measured, and only what Descartes calls the 'primary qualities' of those things, the scientific method has also other limitations. Science works fundamentally by the method of analysis, that is to say, by dividing and sub-dividing the object of study into its constituent parts. It thus tends inevitably to destroy what is the prime reality, namely, *wholeness*. Both A. N. Whitehead in his *Philosophy of Organism*,² and Field-Marshal Smuts in *Holism and Evolution*,³ have drawn attention to the importance of this limitation. It is evident, for example, that in studying the individual parts of a living body, such as the eye, the leg, the muscles, the nerves, each in isolation from the others, there is a serious danger that we may lose sight altogether of the body as one single, harmonious and unified whole; and it is an evident fact of reality that the living organism displays certain characteristics as a unified whole which are not found in any, or in the aggregate, of its constituent parts separately. The analytical method of science is therefore a severe limitation upon the extent of the knowledge which can be acquired by the scientific method. It is not suggested that analysis is the whole of the scientific method: in fact, by analysing alone only very limited knowledge can be acquired. All real scientific discovery involves synthesis and imagination as well as analysis and the patient collection of facts.⁴ But none the less the scientist is limited by the fact that he must begin with analysis.

Again, modern science, as is generally recognized, is becoming more and more statistical in its character. The

¹ *Op cit.* p. 243.

² D. M. Emmet, *Whitehead's Philosophy of Organism* (Macmillan, 1932).

³ J. C. Smuts, *Holism and Evolution* (Macmillan, 1926).

⁴ See Eric Ashby, *Science and the People* (Casement Publications Ltd., Bombay, 1953).

essence of the statistical method is that we consider large numbers of individuals and draw out generalizations from this consideration. But such a method has two clear limitations. First, the knowledge which it can convey is never more than approximate; and, indeed, it is a popular delusion that science furnishes rigidly accurate information. All it can give, and all the real scientist would claim to give, is a reasonable approximation to the truth. Even in some of the more exact branches of experimental science, this is certainly true. To take an example from the science of Rock Analysis, it is a recognized fact that the totals of constituents of rocks in an analysis, though they add up very closely to 100%, yet show a permissible margin or error between 99.75% and 100.5%. In various departments of biology, as well as in physics, the knowledge is purely statistical and approximate, and the application recently carried out of mathematical methods in the sphere of biology is entirely of a statistical character.¹ Only in pure mathematics, which bears no relation to the actual external world, is rigid accuracy possible. In scientific research a reasonable degree of probability is all that is looked for or claimed; and not only here but in the whole field of active, practical life we must "live by faith" in this sense among others, that we must rest content with reasonable probability. The popular demand for certainty, or precise accuracy or conclusive proof, can never be met by science any more than it can by any other method of experience.

There is a second severe limitation to the statistical method, and that is that it must by its very nature be concerned with generalizations rather than with individuals. Thus, C. H. Waddington lists among the four "scientific habits of thought" the "lack of interest in things for their own sakes".² The scientist isolates from the individuals those attributes which each has in common with the rest; but the very qualities which give the individual its individuality, its distinction from the rest of the mass, must be ignored by

¹ See, e.g. R. A. Fisher, *The Genetical Theory of Natural Selection* (Oxford University Press, 1930).

² C. H. Waddington, *The Scientific Attitude*, p. 64 (Pelican Books, 1941).

science and are not amenable to scientific study. It is vital that this fact should be much more widely recognized than it is; for in the sociological and economic sciences increasing use is made of statistical methods in fields of practical application to human welfare and human government; and these methods, since they are based upon statistical generalizations, depend upon the ignoring of all individual characteristics and idiosyncrasies and the reduction of individual personalities to a common factor. There is an increasing tendency in public departments to treat individuals as mere numbers, and this is very natural when the scientific method is applied beyond the field where its scope is properly valid. For our present purpose, however, the important point is to note that this statistical character of scientific method is a severe limitation, and means that science can never give us information about single individuals, except in so far as they share characteristics with large numbers of other individuals. Some of the dangers of the misuse of statistics were charmingly presented by a writer in *The Times Literary Supplement*: "One of the most pitiless features of modern life is the proliferation of statistics. They are seldom comforting to the self-respect, the necessary vanity of the individual human being; they are the evil instruments of those who would plan us into a pattern of existence without variety or creative unexpectedness; and they freeze even the most innocent of our hopes and dreams like the drear-nighted December. They appear as the enemies of all of us, whatever our professional activity; and yet they are often capable of interpretations as diverse as the utterances of the oracle at Delphi."

A wider aspect of this inability of science to deal with individuality is the question of freedom and determinism. Science is bound to assume that the entities with which it deals are fundamentally deterministic in character; that is to say, that their behaviour is rigidly, or at least statistically, controlled by precise principles and external conditions, and that they are incapable of independent volition or action. This assumption, as we have seen, in its application to inanimate things and to the general consistency and regular-

ity of nature, is derived from the Christian doctrine of God and Creation. It was the realization that inanimate things do not possess minds and wills of their own, which led to the rise of modern science in the 15th and 16th centuries. The development of science before this was almost impossible, because under the Aristotelian system and earlier systems of thought inanimate things, such as the planets and stars, were believed to possess independent wills which enabled them to move under their own power; and this naturally would have prevented their being amenable to study by mathematical or scientific methods. It was therefore very right and proper that science should make this deterministic assumption in regard to inanimate things; but having once made the assumption, there was equally evidently a grave danger that it would be extended to other spheres where it had no such appropriate application. In a word, the scientific method can, by its very nature, deal only with those things which do not possess free will or freedom of action. As soon as science attempts to study any object, it is by its own presuppositions bound to make this deterministic assumption about the object it is studying; and therefore the scientific method can only properly be applied in cases where such an assumption is justifiable. This again is a severe limitation upon the scope of the scientific method. It is neither equipped, nor able, to give us reliable or complete knowledge about objects which possess the attribute of freedom or free will; and it therefore tends to deny that *any* objects do possess such an attribute. Thus, Waddington writes in *The Scientific Attitude*, "Freedom is a very troublesome concept for the scientist to discuss, because he is not convinced that in the last analysis, there is such a thing. Science works by discovering causes, and it finds difficulty in admitting that there is a free will, or desires and impulses which have no underlying cause."¹ It is to be observed that in this sentence Professor Waddington uses the word 'cause' in the sense of 'material' or 'efficient' cause.

As already mentioned, Aristotelian philosophy recognized several other types of cause;² and it is a further limitation of science that it concerns itself entirely with material or

¹ *Op. cit.* p. 110.

² See pages, 23, 24.

efficient causes and altogether ignores other causes.¹ As Dr. Eric Ashby writes, "Consider a kettle boiling on the stove, and ask yourself what has caused the water to boil. One answer is that the water is boiling because heat from the burning coal has raised its temperature to 100° centigrade. But another equally valid answer is that the water is boiling because I put the kettle on. Now it is possible to analyse the first cause (called the 'efficient' cause) by scientific method. But it is not possible to analyse the second cause (called the 'final' cause) by scientific method, though some naïve optimists think otherwise."²

It will be noted that in Professor J. Z. Young's recent Reith lectures, "Doubt and Certainty in Science", this datum of experience is substantially ignored, and the whole argument is consequently based upon a presupposition that absolute determinism is applicable to all realms of study. Such disregard for the limitation of the scientific method, such an attempt to extend its assumptions into spheres where they are inapplicable, and such rejection of obvious facts of human experience, must inevitably lead to a clash between religion and science, since religion at this point is bound to insist that science has exceeded its proper scope. On the other hand, it is right and proper for the working scientist to attempt to extend his researches into any sphere to which his previous studies may have led; and there can be no objection to a scientific study of any field, so long as the scientists carrying it out recognize that on account of the limitations of the scientific method they are employing, a considerable amount of knowledge about the particular object in question is bound to escape them. Eddington, discussing the question of freedom, distinguishes three types of behaviour: (i) determined, (ii) undetermined and fortuitous, e.g. the case of electrons, and (iii) undetermined but correlated, or governed by objective law, which is *conscious* law. He adds significantly, "Since non-correlation admittedly represents the objective characteristic of systems to which the ordinary formulae of physics

¹ For a full discussion of the importance of this limitation, see J. L. Stocks *Time, Cause and Eternity* (Macmillan, 1938).

² Eric Ashby, *op. cit.* p.12.

apply, correlation must represent another objective characteristic which—since it is not characteristic of systems to which the formulae of physics apply—is regarded by us as something ‘outside physics’.”¹ Science, in fact, may almost be likened to a game which can only be played if we are prepared to abide by the arbitrary rules. Within these bounds it furnishes useful results and is an extremely valuable intellectual tool; but beyond these bounds it cannot be applied; and there is a wide field of reality which lies outside these bounds.

A further obvious limitation of science is that it depends upon experimental observations which are made by a human observer. While the tendency of modern science is always to eliminate the human observer or the human element so far as possible, it is nevertheless true that in many fields of science the human element still plays a large part, and this means that the accuracy of the observations made is dependent upon purely human factors. For example, for the observation of an experiment depending upon accuracy of sight or colour vision, any weakness in this respect on the part of the observer will affect the accuracy of the observation. Again, the degree to which scientific knowledge is reliable depends upon the instruments available to the experimenter; and while an amazing degree of skill and complexity has been reached in the designing and manufacturing of scientific instruments, it is still true that the power of science to give full knowledge, even in its own field, is limited by the equipment at man’s disposal.

Another limitation of modern science which must be discussed is concerned rather with the attitude than the method of science, that attitude of ‘doubt’ on which science has rested, at any rate since the time of Descartes. Both in his *Discourse on Method* and in his *Meditations on the First Philosophy*, Descartes deliberately inculcates as an intellectual discipline the practice of doubt. Thus, of the four precepts to which he adheres in the *Discourse on Method*, the first is: “To accept nothing as true which I did not clearly recognize to be so; that is to say, carefully to avoid

¹ *Op. cit.* p. 182.

precipitation and prejudice in judgements, and to accept in them nothing more than what was presented to my mind so clearly and distinctly that I could have no occasion to doubt it." But it may be remarked that in Part 4 of the *Discourse* he is led to conclude that there is one thing he cannot doubt—the existence of God, "the Perfect Being".

This attitude of doubt is not in itself in any way anti-Christian or un-Christian. But its practice is bound to involve difficulties for the Christian, because it inculcates a habit of mind inimical to faith. To refuse to accept anything as true without reasonable evidence, and to avoid "precipitation and prejudice in judgements" is indeed an aspect of that intellectual integrity and fidelity to facts and to truth which, as we have already seen, is a characteristic Christian virtue. To distinguish between truth and falsehood, between fact and error, is a characteristic Christian duty, and to use all the resources of one's intellect and reason in order to eradicate prejudice, error and illusion is an admirable practice. The greatest exponents and defenders of the Christian faith have always commended it by an appeal to reason and facts. Its basis rests upon historic events, of which the evidence is to be examined in the light of patient and careful investigation and the use of reason. Thus, to adopt an attitude of doubt and hesitation, of suspended judgement in default of adequate evidence and logical justification, is not necessarily in any way hostile to or destructive of Christian faith. A lazy, credulous, and indiscriminating readiness to accept any sort of legend or fairy-tale is not the mark of a true Christian but of a superstitious pagan. It may, in fact, be said that the chief advances in theological study and biblical interpretation during the last 100 years have been largely due to the adoption of this attitude of scientific doubt and careful investigation, though it must also be pointed out that a similar caution and respect for evidence characterized many of the wisest of the early Fathers and the greatest of the mediaeval Christian philosophers.

But when all this has been said, it still remains true that the practice and discipline of science may develop a set habit

of doubt and hesitation—an attitude which renders it much more difficult to make an act of decision and self-committal where such an act is necessary; and there are quite clearly many points in Christian faith and life where such decision and self-committal must be made, although by the very nature of the case evidence of the type which would be acceptable to science is not available. If it were always clearly understood that there are other types of evidence than scientific evidence, other languages and modes of argument than scientific ones, and other spheres than the material, this tendency would not cause difficulty. But many people, especially students of science and medicine at the present time, grow so accustomed in all their work and thinking to require evidence and reasons of the purely scientific type, that they gradually become incapable of conviction by any other methods. It is vitally necessary to recognize that the scientific method is justifiable only in the scientific field. Moreover, it must be insisted that, as has already been pointed out, the popular conception present in the minds of many young people that the scientific method gives certainty and demonstrative proof where other methods give only superstition and wish-fulfilment is a complete delusion. It is much to be desired that teachers of science in schools should make this perfectly clear to their students.¹

It cannot, further, be denied that, largely owing to the way in which science and the scientific procedure have been presented to young students, faith has become increasingly difficult for them, and an intellectual temper and attitude of mind has developed which inevitably produces a conflict in the minds of young people between their scientific training and their Christian belief. It is this conflict between two different attitudes which at the present time constitutes the major tension between Christianity and science. An attitude of doubt and suspended judgement is in its right place and for its right purpose entirely justifiable, but it must be recognized that such an attitude has its limitations, and that there are times and occasions when it is

¹ Cf. S. R. Humby and E. F. S. James, *Science and Education* (Cambridge University Press, 1942).

absurd to expect proof or material evidence and when a venture of faith and self-committal is absolutely essential. It is the recognition of this truth which forms perhaps the greatest contribution of the philosophy of Existentialism to modern thought (see Appendix C), and it is the failure to recognize it which has rendered arid and barren so much of modern scientific and analytical philosophy.

A further limitation of the scientific method arises from the fact that it concerns itself with the purely material and impersonal. In the words of the modern Jewish philosopher, Martin Buber, it is concerned entirely with the I-It relationship, rather than the I-Thou relationship. But, in fact, it is precisely personal relationships, personal meeting, and personal experience which are the most real and vivid part of human life, and quite evidently a method of knowledge which is compelled to ignore this aspect of reality can never be more than partial. Here again, by their insistence on the importance of the personal, the Existentialists and other personalist modern philosophers have done much to redress the balance disturbed by too great a concentration upon the purely scientific method.¹ But it remains true that a great portion of our population today is educated in a semi- or pseudo-scientific or a technological way, which renders them expert in dealing with things, but quite incapable of dealing with persons or living animals. It is not without significance that we are informed by farmers and agriculturalists that it is very easy to obtain young men to use and maintain the modern mechanical equipment required on farms, but increasingly difficult to find anybody capable of understanding and looking after cattle and other livestock and willing to do it. How far this is really due to true scientific education and how far it is the result of a much more widespread technological bias is not always easy to say; but there is a great confusion in the common mind between what can properly be described as scientific education, and what

¹ See Appendix C. A discussion of this limitation, and of the fact that the existence of the personal observing ego, which the scientific method cannot study or analyse, is a primary and necessary presupposition of all Science, may be found in Karl Heim, *Christian Faith and Natural Science* (1953). See Appendix D.

ought rather to be called technical education or education in invention, engineering, or applied science, and it is the latter rather than the former which encourages so exclusively a concern with the material and impersonal.

It is essential from the Christian point of view that all the limitations of science should be clearly understood and recognized, and if this is done the conflict between the scientific attitude and the Christian attitude will be, resolved, or at least very largely disappear. It must, however, be admitted that it is in this particular sphere that the influence of the scientific developments of the last 300 years has produced the greatest problems and difficulties for the Christian and for Christian faith.

The tendency of a scientific or technological training to depersonalize one's view of life is particularly important in relation to the tension between the habit of the scientist in his work and the basic attitude of the Christian in his faith. For Christian faith is in its core and origin self-committal to Jesus Christ as Master, Lord, and God; as it was for the first disciples, so in a different sense it is for Christians today the spiritual, intellectual, and intuitive discernment of both the incarnation and revelation of God in the character, the work, and the Person of Christ. But we know Christ, both in the pages of the New Testament and in the living experiences of prayer, worship, trust, and salvation, as a Person; we are conscious of a personal relationship with Him through the Holy Spirit. God, Christ, the Holy Spirit, are all referred to in the New Testament and in Christian worship as "He"; the Christian religion is all on (at least) the personal plane, not on the impersonal plane of natural science and technology. Therefore it requires a different attitude of mind, a different habit of thought, a different mode of experience, and a different language, to understand, realize, and express the truths of Christian Faith, from that which is required of the scientist in his scientific work. But when by training and education one has been moulded in the scientific way, it is not easy to re-adapt one's attitude and approach; and the impersonal or depersonalizing character of scientific study and observation do, for many, form a

definite hindrance or obstacle to the appreciation and acceptance of the personal foundation of Christian Faith. The recent development of branches of science, or fields where scientific method has been applied, in sociology, social sciences, some types of psychology (such as industrial psychology), and so forth, may, it is hoped, help to overcome some of this difficulty, by creating 'personal sciences'.¹ But the fact remains that it is necessary for the natural or technical scientist to recognize the limitation of the scope of his science inherent in its impersonal character if he is to do justice to the claims of so very personal a matter as religious faith and the relation of the individual to God.

Associated with this limitation is that to which Professor A. V. Hill referred in his address quoted above—namely, the fact that Science is not concerned with moral or ethical values. Science, as he said, must be ethically neutral. But no man can live a real human life in such a condition. No sooner is he faced with a decision between two lines of conduct than he must inevitably be guided by moral or ethical principles, resting upon values of goodness and right which science, by its very nature and methods, is unable to study or assess. Though it may, by psychological, biological, or even chemical and physical methods, study factors which help to decide human action, yet it has no means of analysing or assessing the principles of goodness or moral values—unless with regard to the latter we accept Professor Julian Huxley's and Professor C. H. Waddington's contention that we can derive moral principles from the study of biological evolution—a contention examined and rejected later in this book. It is equally true that the scientific method can give us no information about Beauty—about the relative aesthetic values of works of Art or Music or Literature. Such things are by their very nature and by the character of the scientific method excluded from its purview. But the man must be either blind or deaf, or deliberately prejudiced, who refuses to recognize the existence and importance of these things, and their part in the whole of human life. Moreover,

¹ On this, cf. the Presidential Address to the British Association in September, 1954, by Lord Adrian.

religion is closely associated with moral values. Our recognition of the uniqueness of the character of Jesus Christ rests at least partly on our realization of His supreme moral and ethical goodness. Our understanding of the nature of God (so far as it goes) must, as the Old Testament prophets so clearly taught, be founded on ethical principles. Our appreciation of His work as Creator requires a recognition of beauty and aesthetic values. It is therefore essential, in order to understand or accept religion, to be aware of the nature and importance of such moral and aesthetic values, and of the fact that we can never learn to know or understand them by the methods of natural or technological science.

We have now indicated some of the inherent limitations of the scientific method. It may be said that we should proceed to indicate also the limitations of the religious method of acquiring knowledge; but it cannot really be said that religion has any limitations. If by religious knowledge or the religious method of acquiring knowledge we refer, as is often done, to spiritual discernment, or to "intuitive recognition of moral values", or to emotional feelings, then we should certainly have to recognize a definite limitation in the religious method of acquiring knowledge. But, in fact, the whole argument of the present book is that the scientific method is in itself one of the methods which religion employs for the study of reality. If it is true that science is the child of the Christian faith, and that those who first developed the method of modern science were deliberately employing it for the purpose of studying the works of the Creator and glorifying God, then it follows that in their work as scientists they were acting as Christians seeking knowledge which could properly be called "religious". Thus, the scientific method should be regarded as one method which Christians employ, to obtain a better understanding of the wisdom of God and the wonders of His Creation, and to achieve the greater welfare and benefit of their fellow men. The antithesis between religious knowledge on the one hand and scientific knowledge on the other is therefore a completely false one. Religion by its very character must be concerned with the whole of reality, including the entire natural world and every

type of material or spiritual existence. Science is definitely one method of studying it, but it is not the only one. Therefore the Christian, precisely because he is prepared to employ both scientific and other methods, is in a far better position to acquire balanced and complete knowledge than the materialist scientist who confines himself solely to one method, the scientific.

PART II

PROBLEMS ARISING OUT OF THE RELATION OF INDIVIDUAL SCIENCES TO CHRISTIAN DOCTRINE

CHAPTER I

PHYSICAL SCIENCES

MANY modern writers on the subject of religion and science devote the major part of their books to a discussion of the bearing of modern physical discoveries upon Christian ideas. Mr. Yarnold, for example, says, "It appears that, even for the most mechanistic biologist, the conflict with Religion must be pushed back into the realm of the purely physical. . . . In all discussion of the relations between Science and Religion we must remember that the biological is the outcome of the chemical, which in turn is the outcome of the physical. The really fundamental problem must be discussed at the physical level."¹ This argument appears to involve a fallacy, for although it is true that in the realm of biology, especially in biochemistry, chemical and physical factors are more and more being studied, yet the behaviour of a biological organism as a whole must be interpreted in biological rather than physical terms. We may agree with the words of A. D. Ritchie, himself a chemical physiologist, as well as a philosopher, "Nor is science synonymous with physics—a common and pernicious fallacy." But in any case this argument by-passes the real point, namely, that it is in connection with modern advances in biology that the really crucial problems arise for Christian faith and doctrine. It is significant that the greater number of physicists who have written on religion and science have been either Christians or at least theists, while many of the best known writers on biology have been anti-Christian or atheistic. In the present book, therefore, it is not proposed to devote much space to the discussion of the relation of recent ideas and advances in physical science to Christian belief. There is still much disagreement about the philosophical implications of modern

¹ G. D. Yarnold, *Christianity and Physical Science*, pp. 32–33 (Mowbray, 1950).

developments in physics. In any case, the ground here has been covered very fully by many writers, including such brilliant popular expositors as Sir Arthur Eddington, Sir Edmund Whittaker, and Sir James Jeans, and, more recently, by J. R. Oppenheimer, Max Born, H. Dingle, C. A. Coulson, and others. For our purpose it will suffice to consider five main ideas of contemporary physics and astronomy and their possible religious significance.

I. RELATIVITY

It would obviously be impossible and out of place to attempt to give here any description of the theory of Relativity, even if the author were qualified to do so. A reader wishing for such a statement can hardly do better than consult Eddington's books, or the works of Professor A. Einstein himself, including *The Evolution of Physics* by Einstein and Infeld. For our present purpose two points may be noticed. First, the new ideas associated with Professor Einstein's Special and General theories of Relativity have overthrown some of the very precise, rigid, and deterministic ideas which were characteristic of the physical scheme associated with Newton. In particular they have greatly modified our ideas on the significance of space and time and their relation to one another; and in view of the enormous importance of the concepts of time and eternity in Christian theology, this in itself is a matter of great significance.¹ Secondly the theory of Relativity has had its effect on the conception of existence and the nature of matter. The theory itself has two parts—the Special Theory of Relativity, applied only to *inertial* co-ordinate systems,² and the General Theory of Relativity, which is valid for *all* co-ordinate systems and attacks the problem of gravitation, and which formulates new structural laws for the gravitational field. In Newtonian physics the observer was thought to be static and passive,

¹ It is impossible to enter into a discussion of this vast subject, and readers who are interested in it are referred to *Time*, by M. F. Cleugh, and *Time and Eternity in Christian Thought*, by F. H. Brabant, as well as to the work already mentioned, *Time, Cause and Eternity*, by J. L. Stocks.

² An "*inertial* co-ordinate system" is a co-ordinate system in which the laws of mechanics are valid, and the system is either at rest or in uniform motion.

and reality was independent of a human observer. In Relativity Physics the observer is not passive, but is actively involved in observation, and there is interchange between him and the object observed. The theory of Relativity denies the assumption that there is such a thing as a unique right frame of space. All frames of space are relative. The ideas of absolute space and time are figments of the imagination. Motion, distances, and volumes are also relative; length, mass, and time are not absolute quantities. They can only be defined relatively to one specified observer. A distance as reckoned by an observer on one star is as "true" as the same distance reckoned, in quite different terms, by an observer on another star. We must not expect them to agree, for the one is a distance relative to one frame, the other is a distance relative to another frame. Similarly, magnetic fields are relative. An electrically charged body at rest on the earth has no magnetic field relative to the terrestrial frame of space; but it has a magnetic field relative to a nebular field of space. We may then wish to ask, Does the magnetic field *exist* or not? The answer is "yes" relative to one frame of space, "no" relative to another. It is clear that this raises philosophical questions as to what is meant by *existence*, and whether in fact there is such a thing as absolute existence at all. None the less, there are invariants in physics; but they are conceptions such as action (the product of energy and time), entropy, number or mathematical statements of relationships. A further consequence of the Special Theory is the connection between mass and energy. Mass is energy and energy has mass. That is to say, the property which gives matter its characteristic solidity (its mass) is simply energy; and energy becomes the one ultimate material of the universe. The General Theory shows that near matter there must be something analogous to a curvature of space-time; and any body entering this curved region tends to move towards or round the matter in a definite path. In fact, that is what is meant by matter—a region in space-time in which this curvature takes place. The Newtonian idea of a substance, as something extended in space and persistent in time, is now meaningless, since neither space nor time is absolute

or real. A substance has become a mere series of events taking place in space-time.

Eddington has pointed out that modern physics operates within a selective field of knowledge, and within that field we observe only relations, not objects in themselves. We are concerned with *observable* behaviour, not *objective* behaviour. This must restrict very greatly the information which physics can give us about the objective world.¹ A tendency has existed among some physicists, notably Jeans, to believe that modern physics has explained away the material universe altogether. Without admitting this, we can agree that modern physical theory has considerably affected what we mean in Physics by matter and by existence. (In addition to the theory of Relativity, the modern conception of the structure of the atom tends in the same direction.) But there are two things to be said about this. The first is that, while modern physics has presented us, to use Eddington's analogy, with a scientific table or, more accurately, a scientific picture of the table, which is very different from the picture of the table which we gain from ordinary everyday experience, it is at least doubtful whether this scientific picture of the table can be said to correspond to objective reality. Professor Stebbing has wisely pointed out that, notwithstanding all the discoveries of the physicists, we still see the same table and apply the word 'table' to the same object as that to which it was previously applied. But the more important side of this matter is that it appears to have been assumed by some clergy and others that if the developments of modern physics throw doubt on the reality or, to use a popular term, the *solidity* of matter, this is a great advantage to religion. Jeans appeared to think that if he could show that all matter had been reduced by modern physics to the status of a mental or intellectual conception, he would have done a service to religion; and there is a popular idea that if the only real things in the world could be shown to be mental or spiritual, that would harmonize with Christian doctrine. For reasons which have already been fully discussed in Part I, the Christian religion has no need of any such attitude towards

¹ See Chapter V.

material things. Christianity, to repeat Archbishop Temple's phrase, is "the most avowedly materialist of all the great religions", and both the doctrine of the Incarnation and the sacramental principle depend for their validity on the real existence of matter as well as the real existence of spirit.¹ It is no service to Christianity to try to prove the unreality or non-existence of material things. But the idea of the insubstantiality of matter has also been encouraged by new developments in the knowledge of the atom, and this is the second aspect of modern physics to which we must turn.

2. THE STRUCTURE OF THE ATOM²

Since the time of John Dalton (1766-1844) modern science has been based upon the atomic conception of matter. The ancient Greek philosophers realized that matter must be either infinitely divisible or, alternatively, that there must be an ultimate or smallest particle of existing matter. Democritus and Lucretius propounded the *philosophical* theory that there must be such ultimate particles or atoms, though they adduced no scientific evidence for this view. Dalton's atomic hypothesis postulated the same alternative and stated that all material things could be divided and subdivided until ultimately one reached the indivisible atoms of which they were composed. In the form in which Dalton put forward his hypothesis and in which it was accepted in 19th century physics, the atom was pictured as a hard, concrete entity, somewhat like an extremely minute billiard ball. Subsequent investigation and experiment confirmed Dalton's hypothesis, and this held the field throughout the whole of the 19th century until at the very end of the century Sir J. J. Thomson, the great English physicist of whom mention has already been made, discovered the electron. Subsequently, the New Zealand-born physicist, Lord Rutherford, in conjunction with the Danish, Niels Bohr, worked out a new theory of the structure of the

¹ See W. Temple, *Nature, Man and God*, pp. 473-495.

² For a recent popular description of present-day atomic physics, see J. R. Oppenheimer, *Science and the Common Understanding* (Oxford University Press, 1954), especially Chapters III and IV.

atom, based upon the researches of Sir J. J. Thomson, and those of Rutherford and Soddy on radio-activity. The essence of this new view of the atom was that, instead of being pictured as a minute, hard, concrete ball, it was pictured rather as a minute solar system, consisting of a central nucleus, carrying a positive charge of electricity, round which a number of electrons, each carrying a charge of negative electricity, rotated in different orbits, somewhat as the planets rotate round the sun in the solar system. Subsequent research, together with the application of the theory of relativity to the structure of the atom, and in particular the discovery by Einstein of the relation between energy and mass, have very greatly modified the original Rutherford-Bohr conception. In the course of the last quarter of a century a number of atomic particles have been discovered in addition to the two original particles, the proton and electron.¹ Most of the later developments concern the structure of the central nucleus of the atom which was soon recognized to be the most important part of it. But in applying an analogy such as that of the solar system to the structure of the atom, it must always be clearly understood that this is simply a pictorial analogy, rather than a scientific theory. The scientific theories of the structure of the atom are all in fact of an extremely mathematical nature and are really an expression in terms of mathematical symbols and equations of relationships existing between fields of energy. Thus, the practical effect of the newer views of atomic structure is to replace the old Victorian idea of matter, as consisting in the ultimate of a number of hard, concrete balls, by a conception of matter as consisting of fields of energy, related to one another in a highly complex and mathematical way.

So we are faced with the fact that the ultimate constituent of the universe is now seen to be the dynamic if unsubstantial entity of "energy", instead of the static if substantial entity of the Victorian atom. This development in our views as to the ultimate nature of matter reinforces the tendency noticed in the previous paragraph for some physicists to maintain

¹ By 1951 the existence of nine different types of particles had been demonstrated, and the existence of two others shown to be probable.

that modern physics has destroyed the substantiality of matter and replaced it by mental, mathematical symbols. But, in fact, the objections mentioned in the previous paragraph to such an interpretation of modern views of matter apply as forcefully in the case of the structure of the atom as they do in the case of the theory of relativity. A table is none the less a really concrete, substantial table because we happen to hold different views about the physical and mathematical expression of its ultimate constitution, and we are no less able to make practical use of our table now than we were when we held the Victorian view of the structure of matter. On the other hand, it does seem significant that modern developments in physics have indicated that the ultimate constituent of the universe is energy; for the Christian view of the universe is a dynamic view. That is to say, Christians believe that the whole universe is the scene of activity, creation and development, the ultimate source of which is the power of the Holy Spirit affecting the world of nature. And if the Christian view is true, surely we should expect to find the evidence of the Holy Spirit in the physical sphere in just such signs of dynamic energy and activity as are indicated by modern physics. If energy is the essential basis of the whole material world, this to the Christian is a clear manifestation of the active, creative Spirit of God in the physical realm.¹

3. THE QUANTUM THEORY

There is, however, one aspect of modern ideas on the theory of the atom to which we must give some particular attention. We have already stated that the Rutherford-Bohr picture of the atom postulated that the atom consists of a central, positively charged nucleus round which circulate in individual orbits a number of negatively-charged particles called electrons. In 1899 Max Planck had discovered the

¹ Modern ideas about the structure of the atom and Einstein's conception of the relationship between mass and energy have had a remarkable and terrifying practical result in the invention of the atomic bomb. The moral implications of this and their bearing on the social responsibility of scientists have already been discussed in Part I, Chapter IV.

Quantum Theory of Radiation. Originally this concerned the way in which light (or, more precisely, black-body radiation) was emitted by systems of vibrators. The old electro-dynamical laws had suggested that each vibrator should gradually come to rest and then stop, as the vibrations of a tuning-fork do, until the vibrator was in some way excited again. Planck discovered that radiant energy is emitted and absorbed by definite amounts, and that there is a minimum quantity of energy just as there is a minimum quantity of matter (an atom). This minimum quantity of energy is called a Quantum. Planck thus showed that a vibrator emits energy discontinuously, that is, as it were, by sudden 'jerks' only. It may possess any integral number of units of energy, but not intermediate, fractional numbers, so that gradual changes of energy are impossible.¹ Einstein suggested that light itself consists of "quanta", later called "photons", which are "atomic particles", as it were, of light. Applying this in simple language to the case of light, we may say that light is emitted in the form of separate or discrete quanta or packets of energy, rather than in continuous waves. (It will be pointed out later in this section that, while this view of light, known as the corpuscular view, will explain certain phenomena, there are other phenomena which can only be explained by picturing light as a wave phenomenon.) In 1913 Niels Bohr applied Planck's Quantum Theory to the structure of the atom and argued that atomic structure does not change its configuration or dissipate its energy by gradual stages, but by changes so abrupt that one may almost regard them as sudden 'jumps'. In the Rutherford-Bohr picture of the atom these jumps arise from the change of an electron from one orbit or stationary state to another, and as an electron changes its state it either emits or takes in a definite quantum of energy. Bohr held that the number of possible states open to the electrons in an atom is extremely limited, but an atom may

¹ Planck's fundamental law connects an energy E with a vibration-frequency ν by the formula $E=h\nu$, where h is a constant. This was later extended by Einstein and de Broglie from the case of vibrations ν per unit time to that of the number of waves k per unit length, which is related to a mechanical momentum p by the corresponding formula $p=hk$, where h is the same constant.

change from one 'permitted' or physically admissible state to another under the stimulus of radiation. From this beginning has developed a highly complex theory of wave mechanics in application to the atom.

But for our purpose one of the vital principles in the ideas of Planck and Bohr is that of discontinuity, i.e. that in nature we do not find a regular unbroken sequence of events, but rather a series of separate and disjointed or spasmodic ones. We shall see that this is equally true in the biological sphere in regard to the role of mutations in the process of evolution, which represents a considerable modification of the Victorian belief in gradual, unbroken, and constant progress. In 1927 Heisenberg, who had already in 1925 introduced important new ideas into Bohr's theory of atomic orbits, postulated a most important fundamental general principle, known as the Principle of Indeterminacy. The essence of this may be said to be that a particle may have position or it may have velocity but it cannot *in any exact sense* be said to have both. The result of this is that the more accurate the determination of the position of a particle, the less accurate is the determination of its velocity or momentum, and vice versa. In application to the structure of the atom, this means that we cannot at the same time accurately determine the position and the velocity of a particular electron. Moreover, this failure is not due to any defect either in the instrument or in the observer: it arises from the fact that it is impossible to observe a particle without affecting either its position or its momentum. An association of exact position with exact momentum can never be discovered, because there is no such thing in physics.¹ In view of the quantum laws, $E=h\nu$ and $p=hk$, we must accept the existence of these limits for

¹ Mathematically, this can be formulated by means of Fourier analysis as follows: in order to define ν and k sharply, it is necessary to have $\Delta\nu$ and Δk very small, hence a very long duration $\Delta t \sim 1/\Delta\nu$ and spatial extension $\Delta l \sim 1/\Delta k$. If one uses the relations $E=h\nu$ and $p=hk$, and rewrites the limiting relations $\Delta t \Delta E \sim h$, $\Delta l \Delta p \sim h$ one sees that with a tiny particle of sharp energy and momentum (small ΔE and Δp) there are associated long intervals of time and space (Δt and Δl). This formula is the expression of Heisenberg's uncertainty relations, and thus we see that the quantum laws lead necessarily to a mutual restriction in the accuracy attainable in space-time location on one hand and energy-momentum determination on the other.

the determination of such pairs of quantities as time-energy, co-ordinate-momentum, which in mechanics are called *conjugate* quantities. An explanation of this in atomic physics was provided by de Broglie, who postulated a model of the particle as a wave group. The transition from the mathematical symbols to actual measurable quantities is made by the introduction of a quantity called "wave-function", expressed by the symbol ψ . The result of such wave-mechanics is that there is no determination for physical objects, such as small particles, but only for the *probability of their appearance*. Moreover, as a consequence of the Principle of Indeterminacy, it follows that it can never be possible to predict the movement of an electron from one state to another, or to which state it will jump; or to determine in an aggregate of atoms which atoms are likely to exhibit the jump from one state to another, and the consequent emission or absorption of energy. But although it is impossible to say when an atom in one state will change to another, if we know both its initial and final state, we *can* deduce the wavelength of the spectrum it will emit. Thus, prediction is from initial and final states, not from a knowledge of initial state to consequent final state. The only type of knowledge we can have concerning the behaviour of sub-atomic particles is of a statistical character, and all laws concerning atomic structure and behaviour must be of this statistical character rather than of the type of exact scientific law so dear to the hearts of Victorian physicists. A further principle, known as the Pauli principle, states that two elementary particles of the same species, e.g. electrons, are absolutely indistinguishable from one another unless they are in different states. We should not talk of individual particles at all. Two electrons are not merely *practically* indistinguishable in principle. Two electrons are just parts of a collective world distribution of electron-matter, and in quantum mechanics the state of such a "collective" is described by a "wave-function". The fact that it is impossible to predict the movements of electrons within an individual atom or the behaviour of individual atoms in an aggregate, and therefore impossible to deduce any "cause" for these

movements, has led some modern physicists to say that the whole conception of causality in science has been overthrown. We have already earlier in this book discussed this contention and found occasion to deny its validity. The fact that the behaviour of an electron is "unpredictable" or the fact that it is impossible at the same time to determine with accuracy both its position and velocity does not seem an adequate reason for supposing that there is no cause at all for such phenomena in the sub-atomic sphere. At the same time, as the very title of Heisenberg's *Principle of Indeterminacy* suggests, these new ideas have gravely modified the absolute and strict determinacy of Newtonian physics and the philosophical ideas derived from them. In so far as Victorian scientists were led to a denial of the possibility of free will or freedom on account of their belief in rigid physical laws, the modification in scientific ideas produced by the work of Planck, Heisenberg, Bohr, de Broglie, Schrödinger, and Dirac has certainly had a beneficial effect on the mentality of physicists; but it seems fantastic to argue as Jeans, for example, has done, that Heisenberg's *Principle of Indeterminacy* has vindicated the existence of human free will. As Professor Stebbing has said in her book *Philosophy and the Physicists*, our belief in free will and moral freedom rests on something very different from our views as to the nature of the structure of the atom. In point of fact, the reality of human free will depends not upon scientific or even philosophical theories, but upon our own everyday experience. We know in fact that we do make choices and that, although the range of possible choices is very considerably limited and determined for us, yet none the less within these limits our power of choice is real. The very existence of human law and of ordered society depends upon the universal recognition by men of this fact of human free will and moral responsibility.

More must be said about this when we come to consider the relation of biology to Christianity; but it does seem worth while to make it clear now that we must not overrate the importance of Heisenberg's *Principle of Indeterminacy* in application to human conduct and behaviour. None the less recent physical developments have greatly altered the struc-

ture of thought in physical Science. For example, Newton's physics was based on the conceptions of space, time, and motion, material point and force. All the phenomena of the external world could be described in terms of the location and motion in space of entities persisting and possessing continuous identity in time. "Absolute space", he wrote, "in its own nature, without regard to anything external, remains always similar and immovable" and "all things are placed in space." (Principia, Schol. ad Defin.) Physical events were regarded as the motions, governed by fixed laws, of material points in space. All happenings were to be interpreted purely mechanically.

This scheme has been progressively modified. First Clerk Maxwell's work led to the conception of electro-magnetic "fields". Whereas previously physical reality was conceived as made up of material points, whose changes consisted exclusively of motion, Clerk Maxwell substituted the idea that reality should be represented by continuous fields, not mechanically explicable. Now Quantum Mechanics deals in its laws with quantities which do not claim to describe physical reality itself but only the probabilities of the occurrence of a physical reality. The Newtonian physics was strictly mechanistic and deterministic: it pictured the universe as a machine constructed by a sublime Intelligence and set in motion in accordance with rigid and exact mathematical rules, operating upon objective material entities in space. Such a mechanistic and rigid material universe is unacceptable to modern physical theories. In so far as they have banished this mechanistic conception they have favoured a Christian, instead of a deist, doctrine of Creation. But that does not mean that the physical universe can now be regarded as *lawless*: it is still described in accordance with exact mathematical and physical laws, but they are "statistical" instead of "causal". As to the significance of this, physicists and philosophers still differ profoundly among themselves; but it cannot be said that modern physics has destroyed the whole conception of causality or every form of determinacy. The question depends upon the description of "cause" and of "determination" adopted. Max Born, for

example, suggests there are two elements in causality—contiguity and antecedence—and that the first is preserved, though the latter is overthrown. He holds that a certain situation depends upon another one, irrespective of time, in a way describable by quantitative laws. It has also been suggested that certain phenomena are describable in statistical terms and others in individual terms—in other words, that statistical and “causal” laws are *complementary languages*. This is explained in the next paragraph. On the other hand determinism and indeterminacy may be regarded as a dialectical thesis and antithesis, awaiting synthesis. But we need not here concern ourselves further with the very abstruse arguments about the precise nature of causality and indeterminacy in atomic physics, in view of what has been said in previous sections about the undoubted necessity for the *fundamental* presupposition of causality in the scientific method of studying the universe.

There is, however, another important development of the Quantum Theory to which we must refer, which has been indicated in previous sections, namely, that of complementary languages. It has been mentioned above that two conceptions of the nature of light have been put forward in modern physics, the corpuscular theory and the wave theory. The same applies to the nature of electrons. Electrons are certainly corpuscular and must be regarded as particles because they can be counted in an atom. On the other hand, as modern physicists have shown, it is only by introducing the ideas of wave mechanics that the modern mathematical conception of the atom, based upon Quantum laws, can be developed. Thus, it is true that in order to describe a situation in atomic physics one has to use both the wave conception, describing a state, i.e. the complete experimental situation, and also the conception of individual particles. Yet the square of the product of two wave-functions representing probability has reality, since the probability itself has reality and predictions based upon probability calculus have a real application.

A further example of the same point has been indicated above, where it was pointed out that statistical and causal laws can be regarded as complementary languages. The true

significance of recent developments in the science of atomic physics is that there are mutually exclusive and complementary situations, or phenomena in a situation, which cannot be described in the same terms but require two kinds of concepts. To this fact Niels Bohr has applied the word "complementarity", and we are thus introduced to the idea of complementary languages needed to deal with different aspects of the same situation. The significance of this will be obvious when we consider that science as a whole and other types of human experience as a whole, such as history and mysticism, also deal with different aspects of the same situation, and we shall therefore expect that they also require complementary languages, which are not contradictory but rather mutually necessary.¹

It may further be pointed out that the principle of complementary languages implies that no complete description of any situation can be given in terms of one language alone. For example, both in physics and biology and in theology it has now been recognized that to study a phenomenon purely by the analytical method of breaking it down into its individual parts in isolation gives a very partial and inadequate idea of the phenomenon as a whole. Thus, in biology the living organism is much more than the sum of its separate parts. Similarly, the attempt to treat man's relation to God purely in terms of isolated individual souls denies the truth so strongly emphasized by St. Paul and St. John—that the individual is a part of a greater whole or organism, the Church, and that any true description of the relation of man to God must treat human beings not only as individual souls but also as members of one Body of Christ or branches of the one Vine. On the other hand, we have already pointed out that to use the statistical method without taking account of individuals can lead, in the sphere of sociology, for example, to results which are first erroneous and ultimately totalitarian. Thus, it is clear that the only sound procedure is to use both the language of analysis and the language of statistics, to study both the individual constituents and the unified whole,

¹ An interesting exposition of the principle of complementarity in modern physics and its wider significance may be found in J. R. Oppenheimer, *Science and the Common Understanding*, Chapters IV, V and VI.

and not to omit or ignore either aspect by using only one language when more are necessary.

The other important consequence of Heisenberg's Principle of Indeterminacy and the Theory of Relativity, and their development in modern physics, is the recognition of the mutual relation and interaction of the observer and the object. The classical physics of Newton taught that there existed an objective physical world, external to the human mind, which behaved in accordance with immutable laws independent of the observer. Quantum mechanics interprets the evidence amassed in atomic physics in another manner. According to this new view, it is the action of the experimentalist, who designs the apparatus, which determines the essential features of the observation. There is, therefore, no objective "existing situation", such as classical physics assumed, and no remote, passive, and static observer. Whether, as some physicists argue, that means that no such thing as an objective external world exists at all, and that "only the observable is real", is very questionable. (It has been denied by Einstein and Planck, for example.) But what is certain is that no observation of the physical world is possible for us in which the observer is not an element which must be taken into account in science. Whereas classical physics assumed natural phenomena to be occurring independently of observation and without reference to it, quantum physics claims only to describe or predict phenomena relative to a clearly defined manner of observation or arrangement of instruments. Even predictions of probabilities can be made only with reference to the whole situation, including the apparatus used; and it is necessary to decide what aspect one wishes to investigate and to construct the instrument accordingly. Moreover, Heisenberg showed that there is always interchange between the observer and the object observed. The very act of observation affects the object, or at least affects the observer's knowledge of it. Thus, the isolated individual has vanished, and the primary importance of "personal encounter" is found in science just as it has long been recognized by Christianity to be a fundamental element in human experience. The static, passive, frigid, scientific

observer beloved of Victorian writers is shown to be an impossible legend.

Moreover, where classical physics studied individual particles in themselves, quantum mechanics studies statistically the pattern, relation, and arrangement of groups of particles; it describes the "*wholeness*" of a situation rather than giving a detailed analysis of its parts. In this it is akin to the conception of *organism* in biology.¹ As Einstein puts it, the quantum-mechanical description is a description not of an individual physical system, but rather of ensembles of systems. Whether, as he believes, it must remain an incomplete description, to be superseded or surpassed by fuller ones, or whether it is, as Bohr, Born, Pauli, and others hold, as complete a description as we can require, does not concern us here. What is important is that the old concept of isolated individualism, characteristic of classical physics, liberalism in politics, and Victorianism in religion, has proved as untenable in physics as in politics and religion. Biology, with its emphasis on organism, and sociology, also agree in emphasising the importance of relationship and community. It is perhaps significant that Quantum mechanics and statistical physics have developed contemporaneously with the Liturgical Movement in Christian theology and worship, which emphasizes the corporate nature of the Church, rather than the individual in isolation.

4. ENTROPY

One other conception of modern physics seems to have an important connection with Christian doctrine. This is the Principle of Entropy, expressed in the Second Law of

¹ Schrödinger, in *Science and Humanism* (Cambridge University Press, 1951), points out that it is also akin to the Aristotelian conception of form as against matter. He remarks that what we mean by saying that any object or view with which we have been familiar is still the same, is that it has the same form rather than that it consists of exactly the same chemical particles. In the case of a view, the stream and meadows may be the same as we knew them twenty years ago, but quite obviously the water and the grass in them are not. Yet in Newtonian physics the idea was that the sameness resided in the persistence of individual atoms or atomic particles. The new idea, which is in fact sounder and less crude and materialistic, is that what is permanent in these ultimate particles or small aggregates is their shape and organization. Thus, as Aristotle insisted, it is form rather than matter which is permanent.

Thermodynamics. The essence of this principle is that any physical or chemical process must take place in such a way as either to leave unaltered or to increase the total Entropy of the bodies taking part in the process. The term "Entropy" used in this law is of a rather curious and negative character. It indicates the degree of randomness or disorder in the constituent particles of any substance or, alternatively, it may be said to indicate the degree to which energy becomes converted from a useful into a useless form. The Second Law of Thermodynamics is in fact a physical law of irreversibility, since it states that in any physical or chemical process the amount of available energy must at the end of the process either remain exactly what it was at the beginning or, alternatively, must decrease. Such a decrease of available energy is an increase in Entropy. The law may therefore be stated in the form, that the material universe tends towards a condition of maximum Entropy, which is a condition of minimum available energy. More pictorially, it means that if we start with a number of molecules (i.e. combinations of atoms) in a body having ordered motion, and then proceed to raise the temperature of the body, this heat represents the substitution of a disordered or chaotic motion of the molecules for the original orderly motion. But while it is easy to transform order into disorder, it is not so easy to transform disorder back into order. Similarly, although it is easy to transform mechanical energy into heat, it is not so easy to transform heat back again into mechanical energy. To take a simple example: if we have two different gases, at the same temperature and pressure, in two different closed vessels, and we allow the two gases to diffuse into each other and become completely mixed, this process is irreversible, for we cannot separate the gases again without effecting changes in other bodies; and moreover, the process is accompanied by an increase in entropy, the entropy of the mixture being greater than the sum of the entropies of the original separate gases. The entropy of an assemblage of molecules can only increase and never diminish, and similarly the entropy of the whole universe can only increase and never diminish; and therefore the available energy of the whole universe must

similarly decrease. This law of increasing entropy seems to exclude the possibility of any cyclic world process. In accordance with this principle, the universe must have begun in a condition of minimum entropy, i.e. maximum available energy, and must ultimately end in a condition of maximum entropy, i.e. minimum available energy. In other words, the whole universe is running down and must always run down.¹ Eventually it will attain its state of maximum entropy when all bodies will be at the same temperature and all activity will have ended.² The steady increase of entropy must have had a beginning, and this at once indicates that the whole universe must have come into existence in this condition of minimum entropy and must also come to its final end in the condition of maximum entropy.

Now the doctrine of Creation cannot be opposed except by postulating that the universe has existed from eternity. Nineteenth-century philosophers tended to hold that view, which was embraced by Karl Marx and Frederick Engels and thus passed into the dogmas of Marxist Communism.³ But in the light of the subsequent development of physical science and of the conception of entropy, this belief in the eternity or everlastingness of the universe becomes incompatible with one of the most fundamental laws of physical science. Thus, the conception of entropy and the Second Law of Thermodynamics seems to supply an exceedingly direct piece of evidence of the truth of the Christian dogma of Creation. It is not for one moment suggested that Christians should believe in the truth of the dogma of Creation merely because physics has discovered the principle of entropy and the Second Law of Thermodynamics; but it is an interesting and significant example of the fact that

¹ It is not actually impossible for entropy to decrease, i.e. for the change of available energy to be in an "upward" rather than a "downward" direction, for the Second Law of Thermodynamics is a law of *probability* only; but the odds against such a change of "direction" in the energy of the Universe as a whole are of the order 10^{19} to 1, so we can treat it as *practically* impossible.

² It must be made clear that these considerations apply to the universe as a whole and not to this earth alone. So far as the destiny of the earth is concerned, it appears probable that it will ultimately be *burnt* by the increasing heat of the Sun as the Sun's hydrogen is increasingly converted to Helium.

³ See Appendix B.

advances of science ultimately lead to the recognition on purely scientific grounds of truths long known to Christians through their faith and through revelation.¹

It may be remarked at this point that physicists in their conception of entropy assert that the universe is continually moving from order to disorder and towards a final condition of universal death; but biologists through their conception of evolution affirm a trend in the direction of higher organization, greater complexity, and fuller life. Professor Sir Edmund Whittaker, whose Riddell Memorial Lectures² contain a most valuable discussion of the relation of the principle of entropy to the Christian doctrine of Creation and of the end of the world, suggests that the reason for this disagreement is that physicists are speaking of the universe as a whole, while biologists are thinking only of happenings on the earth which, as he remarks, "is, so to speak, a little backwater in the cosmic stream where the eddies for a while reverse the direction of the main current." A different interpretation of this divergence is given by Professor E. Schrödinger in his extremely valuable little book entitled, *What is Life?*³

At the same time it must be remarked that several physicists have attempted to escape from this obvious implication of the principle of entropy by suggesting that our present thermodynamics may be a peculiarity of an expanding universe and may be reversible under other conditions. Thus Thomas has formulated a scheme of relativistic thermodynamics in which the second Law is reversed in a contracting universe. Energy would then become more and more available and the re-formation of matter from radiation

¹ In a pamphlet entitled "The Cosmic Drama" (National Council, New York, 1955) Dr. William Pollard, Executive Director of the Oak Ridge Institute of Nuclear Studies, U.S.A., has expounded the views of Professor Gamow that the origin of the universe, some 4,000 million years ago, was due to the sudden appearance of a vast cloud of neutrons in a state of exceedingly rapid expansion, from the radioactive decay of which were produced protons and electrons to form atomic nuclei, and has pointed out that this sudden coming into existence of matter in a very brief moment of time is at least compatible with the Christian conception of "creation ex nihilo:" "In the beginning, God."

² Sir Edmund Whittaker, *The Beginning and End of the World* (Oxford University Press, 1942).

³ E. Schrödinger, *What is Life?* (Cambridge University Press, 1944).

would be possible. We should then be faced with a pulsating universe, in which we chance to be living today in a period of expansion, but need not contemplate a beginning or an end.

Finally, mention must be made of the theories recently advanced by Fred Hoyle of Cambridge and others, according to which the expansion of the universe is counteracted by the continuous creation of new matter. Hoyle points out that, according to the theories of the earlier part of the present century, every receding galaxy will eventually increase its distance from us until it passes beyond the limit of the observable universe. Thus, we should end in a seemingly empty or almost empty universe. But, according to his theory, the number of observable galaxies will in fact remain almost constant. For "new galaxies will have condensed out of the background material at just about the rate necessary to compensate for those that are being lost as a consequence of their passing from our observable universe."¹ This, he believes, will occur because "new material is constantly being created so as to maintain a constant density in the background material". In answer to the question, "Where does this continuously created material come from?" Hoyle rather naïvely remarks that it does not come from anywhere. "Matter", he says, "simply appears. It is created."² This seems a peculiarly inconclusive statement, unless it is combined, as Hoyle refuses to combine it, with a belief in the Christian doctrine of the Creator God. But we can none the less agree with Hoyle when he says that there is nothing inherently more "queer" about the idea of continuous creation than about the idea of the creation of the whole universe at a first instant of time. If Christians find any difficulty in accepting Hoyle's views, it will probably be due to the fact that they have an inadequate conception of the continuing and ever-present power and activity of the creative Holy Spirit, as indeed many Christians have. There are still many in the position of the 18th-century deists, who bring in God to "set the universe going", like a Watchmaker, and imagine that after the initial act of Creation His activity, at any rate

¹ Fred Hoyle, *The Nature of the Universe*, p. 104 (Basil Blackwell, 1950).

² *Ibid.* p. 105.

in the physical world, ceased. Hoyle's conception of continuous creation is put forward as a scientific theory and its truth or falsehood must be determined on purely scientific grounds by purely scientific arguments. But it should clearly be said that it presents no difficulties for Christian people and is in no way irreconcilable with Christian doctrine. Professor W. M. Smart, in his book *The Origin of the Earth*,¹ discusses Mr. Hoyle's views and gives reasons for caution in accepting them. But whether we accept the unqualified conception of entropy, or whether we adopt some such modification as that proposed by Hoyle, we cannot escape from the conclusion that physical science points directly to the intellectual need for the doctrine of Divine Creation and creative activity.

5. THE SIZE OF THE UNIVERSE

One other aspect of the recent advances in physical science ought to be briefly considered. Developments in Astronomy within the last century have increased greatly our knowledge of the size and complexity of the Heavens. The "Milky Way" is a galaxy containing some 100,000,000,000 stars. But this is only a single localized system. The spiral Nebula in Andromeda, the *nearest* of the external galaxies, is 750,000 light-years away from the Earth, i.e. it takes light, travelling 186,000 miles per second, 750,000 years to reach us. There are, within the limits of 500,000,000 light-years, about 100,000,000 of these galaxies. In addition, since 1948, "Radio-Astronomy" has brought us knowledge of vast numbers of hitherto unknown and unseen stars.²

All this compels us to recognize the enormous size of the Universe, and the colossal number of celestial bodies which exist in addition to our own Earth. The mediaeval thinkers pictured the Earth as the centre of the Universe, and man as lord of this centre. We now know that, astronomically speaking, the Earth is completely insignificant and man a by-product of an infinitesimally small corner of the Universe. This certainly requires a re-orientation of man's idea of his

¹ W. M. Smart, *The Origin of the Earth* (Cambridge University Press, 1951).

² See Bernard Lovell and J. A. Clegg, *Radio Astronomy* (Chapman & Hall, 1952).

own importance, which is very beneficial for his pride. The older view led to man's regarding himself as the supremely important being, for whose benefit the Universe and all that was in it had been designed; and it often resulted in a view of "special providence" and limited teleology which was unscientific and sometimes ludicrous—as, for example, that God created oysters solely in order that men might enjoy eating them! But the immense size of the Universe constitutes no reason for regarding man as entirely worthless, or his existence as meaningless. Value does not depend on size; quality matters more than quantity. As F. R. Ramsey said in his *Foundations of Mathematics* (quoted by Susan Stebbing): "Where I seem to differ from some of my friends is in attaching little importance to physical size. I don't feel in the least humble before the vastness of the heavens. The stars may be large, but they cannot think or love; and these are qualities which impress me far more than size does. I take no credit for weighing nearly seventeen stone. My picture of the world is drawn in perspective, and not like a model to scale. The foreground is occupied by human beings and the stars are all as small as threepenny bits." Surely we may well consider that the beauty and glory of the stars are far more important than their size.

Moreover, the realization of the tremendous size and complexity of the Universe should increase our reverence and awe for the Creator of it all; but for our own spiritual well-being we need only to know His personal care for each one of us and His dealings with this world; and in fact the Bible does confine itself almost entirely to the Earth, rather than extending its attention to other worlds. It may be that geology, which restricts its study to the Earth, is at least as important as, and certainly of more practical utility than, astronomy with its wider range. Whether life, in any recognizable form, can or does exist on other worlds, is an uncertain and disputed question; but if it does, we can know, and need to know, nothing of its particular spiritual problems or of God's plan for, and dealings with, it. Christians have never claimed to have *complete* knowledge of God; on the other hand, they have insisted that any such complete

knowledge of Him or of His activities is impossible for humanity with its very finite and limited intellectual capacity. What they do claim is that God has revealed to us, in one way or another, such knowledge about Himself as is within the grasp of our minds and is necessary for our spiritual and moral well-being. Christianity tells us of God's purpose and salvation for mankind and this Earth. That is all we need to know. His relation to other worlds and to the Universe may well remain a wondrous mystery.¹

The whole subject is admirably summed up in a poem by Alice Meynell—*Christ in the Universe*.

With this ambiguous earth
His dealings have been told us. These abide:
The signal to a maid, the human birth,
The lesson, and the young Man crucified.

But not a star of all
The innumerable host of stars has heard
How He administered this terrestrial ball.
Our race have kept their Lord's entrusted Word.

Of His earth-visiting feet
None knows the secret, cherished, perilous,
The terrible, shamefast, frightened, whispered, sweet
Heart-shattering secret of His way with us.

No planet knows that this
Our wayside planet, carrying land and wave
Love and life multiplied, and pain and bliss,
Bears, as chief treasure, one forsaken grave.

Nor, in our little day,
May His devices with the heavens be guessed,
His pilgrimage to thread the Milky Way
Or His bestowals there be manifest.

But in the eternities,
Doubtless we shall compare together, hear
A million alien Gospels, in what guise
He trod the Pleiades, the Lyre, the Bear.

O, be prepared, my Soul!
To read the inconceivable, to scan
The million forms of God those stars unroll
When, in our turn, we show to them a Man.

¹ For an admirable discussion of this matter, see an article by E. L. Mascall, "Is the Incarnation Unique?", *Theology*, Vol. LVI, p. 288 (August, 1953).

CHAPTER II

BIOLOGICAL SCIENCES

As has been already indicated in Part I, the problems for religion raised by the development of the biological sciences during the last hundred years are of a very much more profound and far-reaching character than any raised by the physical sciences. We shall now discuss some of the more vital issues raised by biological science.

I. THE ORIGIN OF LIFE AND THE RELATIONSHIP OF ANIMATE TO INANIMATE MATTER

Many writers, Christian as well as non-Christian, seem to consider that the transition from non-living to living material involves an absolute and complete break and that there is something highly mystical in the nature of life itself. This conclusion is not really supported by the advances of modern science. On the one hand it may be admitted that there are very important differences between living and non-living material, and that the former possesses certain fundamental characteristics which are nowhere exhibited by the latter. But these characteristics can be expressed in terms of physical science and are not in themselves either mystical or mysterious, though they are highly complex. It has even been suggested that the very term "life" should be eliminated on the ground that "it is an undefinable abstraction and we can get along perfectly well with 'living organisms'." Woodger¹ quotes Starling, *Principles of Human Physiology*, as follows: "This short summary of the chief characteristics of living beings would be incomplete without the mention of what is perhaps their distinctive feature, namely, organization"; and he points out that the essential characteristic of life is that it is

¹ J. H. Woodger, *Biological Principles*, p. 289 (Kegan Paul, 1929).

a certain type of biological organization, not a concrete entity. The fundamental distinction between living and non-living matter would appear to rest upon two things. First, a living organism is a unit in which the substances composing it are actively associated with one another within certain ranges of physical conditions. It displays the characteristic of organization, so that the substances within it, just because they are part of the organism, exhibit a different behaviour from that which they display either separately or in any inanimate chemical combination. Such substances can exist separately in an inanimate condition, but in the living organism they interact collectively one with another. Secondly, a living body has the power to maintain itself by counteracting its own gain of entropy.]

Professor E. Schrödinger, whose book, *What is Life?*, is one of the most interesting studies of the physical basis of life and the relation of animate to inanimate matter, writes as follows: "What is the characteristic feature of life? When is a piece of matter said to be alive? When it goes on 'doing something', moving, exchanging material with its environment, and so forth, and that for a much longer period than we would expect an inanimate piece of matter to 'keep going' under similar circumstances. When a system that is not alive is isolated or placed in a uniform environment, all motion usually comes to a standstill very soon as a result of various kinds of friction; differences of electric or chemical potential are equalized, substances which tend to form a chemical compound do so, temperature becomes uniform by heat conduction. After that the whole system fades away into a dead, inert lump of matter. A permanent state is reached, in which no observable events occur. The physicist calls this the state of thermodynamical equilibrium, or of 'maximum entropy'. . . . It is by avoiding the rapid decay into the inert state of 'equilibrium' that an organism appears so enigmatic; so much so, that from the earliest times of human thought some special non-physical or supernatural force (*vis viva*, *entelechy*) was claimed to be operative in the organism, and in some quarters is still claimed".¹

¹ *op. cit.*, pp. 70, 71.

How does the living organism avoid decay? By taking in energy—a process accomplished through eating and digestion in man and animals, and by photosynthesis in green plants—and then by building up some of the energy into new tissues and using some of it for the work necessary to keep the organism alive. This is called *metabolism*.

“Every process, event, happening—call it what you will; in a word, everything that is going on in Nature means an increase of the entropy of the part of the world where it is going on. [Thus a living organism continually increases its entropy—or, as you may say, produces positive entropy—and thus tends to approach the dangerous state of maximum entropy, which is death.] It can only keep aloof from it, i.e. alive, by continually drawing from its environment negative entropy—which is something very positive as we shall immediately see. [What an organism feeds upon is negative entropy. Or, to put it less paradoxically, the essential thing in metabolism is that the organism succeeds in freeing itself from all the entropy it cannot help producing while alive.]”¹

It has already been pointed out in previous sections that entropy really means ‘disorder’. Thus Schrödinger continues: “The awkward expression ‘negative entropy’ can be replaced by a better one: entropy, taken with the negative sign, is itself a measure of order. [Thus the device by which an organism maintains itself stationary at a fairly high level of orderliness (= a fairly low level of entropy) really consists in continually sucking orderliness from its environment.] This conclusion is less paradoxical than it appears at first sight. Rather could it be blamed for triviality. Indeed, in the case of higher animals we know the kind of orderliness they feed upon well enough, viz, the extremely well-ordered state of matter in more or less complicated organic compounds, which serve them as foodstuffs. After utilizing it they return it in a very much degraded form—not entirely degraded, however, for plants can still make use of it. (These, of course, have their most powerful supply of ‘negative entropy’ in the sunlight.)

“What I wish to make clear is, in short, that from all we

¹ *Ibid*, p. 72.

have learnt about the structure of living matter, we must be prepared to find it working in a manner that cannot be reduced to the ordinary laws of physics. And that not on the ground that there is any 'new force' or what not, directing the behaviour of the single atoms within a living organism, but because the construction is different from anything we have yet tested in the physical laboratory."¹

From all this it will be clear that, while there is a very great difference between living and non-living matter, yet it is not a difference of a mystical character, but (rather of a new form of organization) or, to use the term employed by Joseph Needham, "a new integrative level".² But there is no justification for the suggestion that the transition from the living to the non-living is completely abrupt or represents an absolute break in the continuity of natural history.

There are two types of complex chemical bodies which may illustrate the transition from the inanimate to the animate. The first are those highly complicated organic chemical compounds called Proteins.³ The second are the much more interesting Viruses. The viruses are a highly unpleasant type of extremely primitive organism or extremely complex chemical compound which are responsible for most of the worst and most unpleasant diseases that affect the animal and plant world. They are of an exceedingly minute character: for example, the Virus which causes poliomyelitis is less than 1/200 millionth of the size of a red blood cell. But although they are so minute, their presence can be detected and to some extent their nature can be studied; and it is apparent that the question, "Is a Virus a living or non-living thing?" is an exceedingly difficult one to answer. Dr. K. M. Smith, a great authority on the Viruses, writes as follows: "Many people have asked the question, Are viruses living or non-living? This starts a hare which can never be caught, because there is no precise definition of a living thing or exact criterion of life. We cannot do better here than

¹ *Ibid.* pp. 75, 76.

² Joseph Needham: "Integrative Levels" (reprinted in *Time, The Refreshing River*, Allen & Unwin, 1943).

³ M. V. Tracey, *Proteins and Life* (The Pilot Press, Ltd, 1948).

quote a remark made over 2000 years ago by Aristotle: (Nature makes so gradual a transition from the inanimate to the animate kingdom that the boundary lines which separate them are indistinct and doubtful.) We may perhaps be allowed to put the question in a slightly different form and speculate whether the viruses form a series of which the more complex fall on one side, and the less complex on the other side of the shadowy boundary which separates the living from the non-living.

"The theories which have been put forward to explain the viruses fall into two categories: first, that which supposes a virus to be a micro-organism comparable perhaps to a bacterium of extremely small size, and secondly, that which defines the virus as a chemical, possessing unusual properties, which may be the product of the disordered cell itself. (In the former case a virus could be regarded as a degradation of the higher forms of organization and in the latter as a link between the higher and lower forms.)"

Smith goes on to quote from a paper by the American, W. M. Stanley, as follows: "As we go from the admittedly non-living to the admittedly living, I think there must be a transition stage where there are entities that may possess some properties that are considered characteristic of non-living things. What could fill this place more simply and logically than the high molecular weight virus proteins that are intermediate in complexity between the protein enzymes and hormones, the wonderful properties of which we already recognize, and the system of proteins that we call protoplasm and which constitutes life? There is evidence that even within the virus group there is a gradual increase in complexity of structure from the small nucleo-proteins to the more elaborate elementary-body type of virus. There is, however, no sharp break despite the fact that in certain respects the structure of the latter may resemble that of a cell-type organism as much as it resembles that of the smaller viruses."¹

These quotations should make it clear that it is extremely difficult to discover any point at which we can definitely say

¹ K. M. Smith, *The Virus: Life's Enemy*, pp. 37-38, 47 (Cambridge University Press, 1938).

we have crossed a sharp line from non-living to living. There are, in fact, no such sharp lines in nature. It may be pointed out that we frequently think of one of the chief characteristics of living things as being their power to grow or to reproduce themselves; but anybody who has observed the growth of a crystal of copper sulphate from an appropriate solution knows that (the power of growth is by no means limited to animate matter.) Moreover, Schrödinger, in the book to which reference has already been made, argues that the 'gene', which is itself the basis of all inheritance and of the maintenance of life from generation to generation, is an a-periodic crystal.² The crystals with which we are familiar in chemistry and mineralogy are of a periodic type, though some of these crystals are themselves of so complex a nature that they have so far defied even X-Ray analysis, e.g. epidote. But these are in every case of a structure which is *repetitive*. An a-periodic crystal, on the other hand, does not show this regular repetitive structure. Schrödinger also makes another interesting observation when he points out that, as we have already stated in a previous section, in the case of inorganic matter the process of activity is always from order to disorder, with an increase of entropy, and the appearance of order suggested by physical laws can only be obtained on a statistical basis by considering vast numbers of units. But Schrödinger goes on to argue that in living matter the process of activity is from order to order, and the living cell gets rid of the entropy it produces, so that the phenomena in living matter are controlled by exact mechanical laws. Thus, he points out that in relation to living matter we need to modify the statement made in the previous section, that all physical laws are statistical. (From the Christian point of view, however, the important conclusion of all this is that there is no need to postulate, as many theologians have thought fit to do, the necessity for a direct act of divine intervention to produce the transition from non-living to living matter.) Life in itself is no secret, mysterious or mystical, but something which can be studied and analysed in a strictly chemical and even physical manner. It has emerged

² See also Appendix D, page 294.

in the process of evolution, by a new "integration" of pre-existing chemical factors. But that is not to say that its ultimate origin is not the creative power of God. (The essential characteristic of life is, as we have seen, its continuous and self-renewing *activity* and the dependence of each living unit on another.) Activity is the primary basis of life, as energy (or energy-change) is of physical matter. But whence comes the dynamic source of this activity, and how did it first begin? To this the Christian must answer, in accordance with the Christian doctrine of Creation, "From God". (The source of the activity that is life is the life-giving Creative Word or Logos. Activity, the "Breath of God", is the evidence of the power and work of the Holy Spirit.) But the production of life was not a process different in kind from the formation of the chemical elements by the agency of the same Spirit. The dynamic, continuous creative impetus in Nature, animate or inanimate, is the touch of the Holy Spirit.

2. EVOLUTION

The gradual transition from non-living to living matter, indicated in the previous paragraphs, represents the first stage in what is commonly called the process of Evolution. It is now generally agreed among all reputable scientists that the history of this world from its earliest beginnings to the present time is one of gradual, cumulative development. From the time when the earth had cooled and the solid crust and oceans had formed, the essential stages of this process can be traced out by direct observation of the successive strata or layers of the rocks, though it is not possible to reconstruct all the changes of topography. The age of the earliest rocks can be shown by several different methods to be somewhere in the neighbourhood of two to three thousand million years.¹ These earliest rocks (Pre-Cambrian or Archaean) show not the slightest trace of any living organism. The present author has examined under the microscope a large number of sections of Archaean rocks from the Malvern Hills, and from this evidence, together with a general survey of the Lewisian

¹ Cf. L. Hawkes "Geology and Time": University of Nottingham Abbott Memorial Lecture, 1952.

Gneiss and allied rocks of North-west Scotland, he can certify to the truth of this statement. The length of time represented by the various stages of the Pre-Cambrian era is probably in the neighbourhood of 1,000–1,500 million years, equal to that covered by all the later strata of rocks put together.¹ It would thus appear that, even if, as has sometimes been suggested, there are, in the form of carbon, minute and doubtful traces of life in the latest Pre-Cambrian rocks, for at least half of the period of the earth's history there was no kind of life upon this planet, unless it was in forms so simple as to leave no fossils behind them in the rocks.² From this point each successive system of rocks contains its own particular varieties of fossils. There are two primary types of rocks—igneous, which are crystalline rocks produced either by volcanic activity, or in other ways, by the crystallization of hot molten material from the interior of the earth's crust; and sedimentary rocks, which consist of fragments denuded from the exposed parts of the earth's surface and deposited under water or in deserts. Those sedimentary rocks which, where they have not been disturbed, lie undermost, are obviously the oldest, whereas those which lie uppermost are the youngest. The sedimentary rocks have been deposited in lakes, estuaries or seas from the material brought down by rivers and other means of water-transport or glaciation from the higher regions, and among the remains so brought down and deposited will be the hard shells and bones of animals and the skeletal leaves and stems of plants, which have become embedded in the rocks.

Therefore, by comparing the biological remains in each successive system of rocks, it is possible to trace the development

¹ For a description of modern radioactivity methods of dating rocks, and the evidence for these dates, see "The Determination of Geological Age by means of Radioactivity," by S. C. Curran, *Quarterly Reviews of the Chemical Society*, London, Vol. VII, No. 1, 1953.

² See L. Hawkes, *op. cit.* p. 11. He points out that "the state of oxidation of the iron in the earliest sediments indicates the presence of oxygen in the atmosphere when they were formed—and this taken along with the other evidence indicates that conditions suitable for life as we know it have existed from the beginning. . . . Clearly life must have existed long before Cambrian times. Carbon is disseminated through many Pre-Cambrian sediments and the most probable origin for it is an organic one."

of living organisms on this earth from their earliest appearance up to the present time; and the evidence so obtained is not a matter of dispute but of fact, and must be accepted by all unbiased and unprejudiced Christian people. The record of the rocks is undeniable. The question of the process by which the development took place is a matter of some speculation, but that there has been such development or evolution is not a matter of theory. It is an obvious and unquestionable fact. Moreover, it is supported not only by the evidence of fossils (Palaeontology), but also by the facts of Embryology, since the embryos of humans and other animals recapitulate before birth various stages in the previous evolution of the species, and this affords an independent line of confirmatory evidence for that derived from the fossils. [We must, therefore, say that any Christian who rejects this evidence is refusing to accept the witness of God's own handiwork.] It may be remarked that there is practically no leading theologian or thinker, at any rate in the Church of England, at the present time who would deny these facts.

If we trace out by the methods indicated above the course of development of this Earth's history, we note that in the Cambrian period, which immediately succeeds the Archaean period and is the first in which we find clear and unbroken fossil remains, these remains are of very simple forms of marine life only. They include small shell-fish (brachiopods), trilobites (which are distantly related to the crabs and lobsters), small organisms known as graptolites, of which no representatives remain today, and primitive sponges. In the next period we find further development of these organisms, while in the following (Silurian) period the first vertebrates (fishes) appear. In the next period (Devonian) the fishes are the dominant animals, while certain amphibians make their appearance; and the earliest plants (Rhynia and Hornea, Lycopodiales, and Archaeocalamites) are found, and are even abundant in some localities by the end of the period.¹ It has been estimated that this Devonian and Old

¹ But cf. L. Hawkes, *op. cit.* "If we accept the view that the oxygen of the primaeval atmosphere was produced by plants, we carry the origin of life back some 3,000 million years."

Red Sandstone period began about 360 million years ago, 200 million years after the beginning of the Cambrian. After this comes the Carboniferous period, in which reptiles and insects appear, together with sharks, and when the land was covered with swamp forests, including conifers. To this succeeded the Permian, by the end of which the first mammals had arisen and cycads appeared among plants. In the next period (the Jurassic), which began rather over 150 million years ago, toothed birds, dinosaurs, sea-living reptiles, and other organisms came into being. After this came the Cretaceous period, when the great chalk downs were deposited and in which the dominant animals of the previous period died out, while small mammals began to flourish and flowering plants and deciduous trees first appeared. The end of the Cretaceous period was about 60 million years ago, and thereafter modern forms of mammals developed, together with a modern flora. Finally, at the very end of the whole process and much less than a million years ago, Man made his first primitive appearance upon the Earth.

This is a very brief and generalized account of the record of the rocks, but it does clearly show us the general character of the evolutionary process. (We begin with inanimate matter and proceed to the first small primitive forms of life.) As time goes on we find more and more complex types of organisms. The animals begin to exhibit a skeleton based upon the vertebra, and at the same time there is evidence of the development of a nervous system, which soon includes the nerve centre. This grows more and more complex until finally in the higher animals the nerve centre becomes a definite brain and culminates in the human mind.

In the 19th century most Christian theologians adopted an attitude of hostility towards the idea of evolution, because they believed it to be completely incompatible with the early chapters of Genesis, and also because they thought it derogatory to the dignity of man. We do not propose here to enter into a description of the famous controversy between T. H. Huxley and Bishop Wilberforce, of which an account may be found in Dr. C. E. Raven's little book, *Science*,

Religion and the Future.¹ The controversy which raged at that time is now largely dead, though efforts are made from time to time to revive it, often by a misrepresentation on the part of Christians of the nature and weight of the scientific evidence in favour of evolution. But the majority of theologians are now satisfied that there is no necessary contradiction between the idea of evolution and the Christian doctrine of creation.² Modern biblical scholarship, and research into the creation epics of nations and civilizations surrounding Palestine in the days of the Hebrews, has indicated that much of the detail of the first and second chapters of Genesis is derived from pagan creation epics current in these nations. What is characteristic of the Hebrew creation epics preserved in the first and second chapters of Genesis is not any different from those of neighbouring peoples in "scientific" detail, but a profound divergence in the doctrine of God and the spiritual principles which they enshrine. Thus, the important point in the first chapter of Genesis is not the precise order in which various living organisms come into being, or the details of the process of creation there suggested, but rather the central fact of creation itself and the doctrine that God is the origin of all created things, all life, and all existence. In any case, the first chapter of Genesis does not present us with a picture of God producing the whole finished world "with a big bang" in one instant of time. Rather it shows us God creating and moulding His handiwork stage by stage. The picture is far more that of a Master-artist or Master-sculptor than of an omnipotent potentate, creating without effort and without development by a mere autocratic fiat. Charles Darwin, in putting forward the theory of evolution in his classic work, *The Origin of Species*, ended his book with these

¹ C. E. Raven, *Science, Religion and the Future* (Cambridge University Press, 1943).

² It is worth remarking that neither Genesis nor any New Testament writer attempts to date the Creation or the age of the Earth. The date, 4004 B.C., which was formerly printed (without authority) in the margins of Bibles was worked out by Archbishop Ussher in the 17th century by adding up the years mentioned in the Old Testament genealogies. It has no place whatever in Christian doctrine.

words: "There is a grandeur in this view of life, with its several powers, having been originally breathed by the Creator into a few forms or into one; and that whilst this planet has gone cycling on according to the fixed law of gravity, from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved." There seems no reason why a Christian should not entirely endorse these words. We are bound to protest against the suggestion that the process of evolution is a purely and entirely mechanical one and that God, having once set it in motion, leaves it to work itself out, remaining aloof, uninterested, and inactive. Such a view is by no means required by the facts of evolution. (It is the way of God to work in nature through consistent and regular processes which we call the principles of nature.) But the fact that we do not need and are unwilling to postulate direct, obvious, and miraculous divine intervention in the process at various stages does not mean that we do not believe that (God is constantly guiding and controlling it though using natural forces and principles to achieve His ends.) Moreover, there must be, to supply the dynamic force or activity manifested in evolution and, indeed, in the whole of the biological world, some source of creative power and energy. To the Christian such a conception is only an obvious expression of the doctrine of the Holy Spirit, the Lord and Giver of Life, the "Creator Spiritus" of the ancient hymn.

Turning to the question of the interpretation of the early chapters of Genesis, we have stated that these chapters are creation *epics*, i.e. *poems*. They were written as, and intended to be interpreted as, poetry. They were imaginative creations, in poetic language,¹ and no Oriental people would attempt to interpret them in any other way. Great mischief has been caused by the misrepresentation of them by totally unimaginative and literal English and Western minds. We must reiterate that the purpose of those who wrote them was never to give a precise scientific account of the Creation, but

¹ We have already drawn attention to the use of complementary languages in physics. To interpret one language, e.g. poetry or myth, as if it were another, e.g. scientific description, can only lead to confusion and chaos.

rather to enshrine in splendid language and rich symbolism the profound truth of the doctrine of God, the Creator. The second chapter of Genesis contains a singularly beautiful and profound parable, and here again the fundamental purpose of the story is not in any way connected with the details of the creative process, but is concerned with the origin of Sin and the need for Redemption. To utilize such chapters as if they had been written as scientific text-books is both puerile and absurd. If they are interpreted spiritually, morally, and poetically, there can be no possible reason why Christians should quarrel with the conception of evolution, which in fact presents us with an idea of creation nobler and easier to reconcile with the Christian doctrine of God than the old conception of completed creation in a moment of time.

A further matter on which some Christians have criticized the theory of evolution is that they consider it inadequate to explain the production of new genera or species. In particular it has been suggested that the larger changes in the process of biological evolution cannot be accounted for except by God's direct creative intervention, producing such new species. Thus, such Christians argue, while the theory of evolution as put forward by Darwin supplies an explanation for the smaller changes, and possibly for the appearance of new species, it will not explain the appearance of new classes of organisms. The answer to this objection depends partly upon purely scientific evidence, and must be determined by considering whether the facts available show sufficiently clearly that these major changes and the appearance of new classes of organisms can be traced through the record of palaeontology or embryology so as to justify the assertion that they took place gradually, stage by stage. In the opinion of the vast majority of geologists and biologists this is the case, and there seems no reason why Christians should wish to deny it. For the production of new classes is no less the work of the creative activity of God if it takes place by gradual stages than if it takes place by sudden direct divine intervention.

Thus, our final conclusion must be that there is no necessity for any conflict between scientists and Christians in regard to the central *fact* of evolution; but this does not mean

that the *interpretation* of evolution will not raise great moral and philosophical problems which are of the deepest concern to Christian people, and to this aspect of the matter we must now turn.

3. NATURAL SELECTION AND THE INHERITANCE OF ACQUIRED CHARACTERISTICS: GENETICS

The essence of Darwin's theory of evolution is the principle of Natural Selection.¹ Certain facts may be observed from the study of biological nature, and upon these facts Darwin based two deductions. The first fact is the tendency of all organisms to increase in a geometrical ratio. This is because offspring are always more numerous than their parents, the only exception being in the case of certain human populations. This should produce a very rapid increase in the population of all organisms; but in spite of this tendency to progressive increase, we note the second fact, namely, that the numbers of a given species are actually found to remain more or less constant. Indeed, this must inevitably be so, for otherwise the earth would long since have been populated by numbers of various organisms which it could not possibly support, either in respect of space or in respect of sources of nourishment for them. From these two facts Darwin deduced the principle of the Struggle for Existence. Since more individuals are produced in each generation than can possibly survive, there must be competition among them for survival. The struggle is actually for survival of the stock, which must include reproduction. The third fact is that of variation. From generation to generation all organisms vary slightly but appreciably and some of these variations are inheritable. From this fact, taken in combination with the principle of the Struggle for Existence, Darwin deduced the principle of Natural Selection. Since in each generation there is a fierce struggle for existence among individuals, and since all these individuals are not alike, those

¹ For a good discussion of the ideas put forward by Darwin in *The Origin of Species*, and of their repercussion on contemporary thought, see C. E. Raven, *Science and Religion*, pp. 178-182 (Cambridge University Press, 1953).

which show variations advantageous in their struggle to survive will in fact survive, while those which show unfavourable variations will be eliminated; or, to put it less rigidly, a higher proportion of individuals with favourable variations will on the average survive, whereas a higher proportion of those with unfavourable variations will die or fail to reproduce themselves. Moreover, since many variations are transmitted by heredity, these effects of survival or elimination will in large measure accumulate from generation to generation. This is in very brief outline the essence of the Darwinian theory of evolution.

The first two facts, the tendency of organisms to increase and the observed constancy in the numbers of any species, are unquestioned by biologists today, and it is therefore impossible to escape the conclusion that the biological world is dominated by a constant struggle for existence, both among the individuals of a particular species and between different species. Biological controversy has centred upon the mechanism of variation, and the question whether or not acquired variations are inheritable. The conception of a struggle for existence had been recognized before Darwin wrote, and the French biologist, Lamarck, had suggested that survival was due to "deliberate", though not necessarily conscious, effort on the part of an organism to adapt itself to its environment. He therefore suggested that those organisms which showed the greatest adaptability to their environment survived best; that they induced in themselves favourable variations, and that such favourable variations or "acquired characteristics" were transmissible by heredity. This inheritance of acquired characteristics was rejected by Darwin, at any rate as the primary mechanism of survival. Darwin argued that so far from survival depending upon any deliberate effort of the organism to adapt itself to its environment, it resulted simply from the inevitable working of the principle of natural selection.¹

¹ It is notable that there is little direct evidence in favour of natural selection; Robson and Richards in *The Variations of Animals in Nature* (1936) can cite only one proven example of natural selection—that of protective colouring in the Praying Mantis.

A characteristic, though somewhat childish, example which illustrates the controversy vividly, though not perhaps altogether accurately, is that of the "giraffe's neck". According to Lamarck's view, giraffes feed on trees. In any generation those giraffes which have the longest necks will stand the greatest chance of getting the maximum nourishment. Giraffes which stretch their necks higher than others will therefore come off best in the struggle for existence. He then goes on to say that if, in the course of its life, a giraffe succeeds in stretching its neck, its children will be born with longer necks than the average and will therefore start with a corresponding advantage.

On the other hand, according to Darwin, by a natural law of averages it will happen that in any generation a small percentage will be born with longer necks than usual. These in fact will triumph in the struggle for existence and will therefore inevitably produce more offspring; and, since they belong to a long-necked strain, the long neck is part of the hereditary characteristics of these individuals from generation to generation. Thus, in course of time they will form a higher percentage of the species, and those with shorter necks will gradually be eliminated in successive generations. The process is not due to any attempt on the part of the giraffe to stretch its neck, nor to the fact that a giraffe whose neck has become stretched can hand on its acquired characteristic to the next generation, but simply to the natural working of the law of averages and the elimination of the unfit.

In any generation a minority of individuals will show variations which are in fact favourable to survival. These variations are due not to any sort of deliberate effort on the part of the parents to adapt themselves to their environment, but to purely mechanical (physical or chemical) causes. Similarly, in any generation a minority of individuals will show variations from the norm which are unfavourable and they will automatically be eliminated. Of the mediocre majority so many will survive as there may be means to support. Thus, in the next generation there will be a higher proportion of offspring of the minority with favourable variations and a lower proportion of offspring of the mediocre

majority. In this way each generation will show a gradual but automatic progress, in the sense of a better adaptation to their environment. Again, if the environment changes, those individuals will survive which happen to be best adapted to the new environment. Thus, whereas Lamarckism postulates some sort of deliberate effort on the part of the organism, Darwinism rules this out entirely, and the principle of natural selection is a process resting in a sense upon purely accidental variations.

Since Darwin's day a great deal of research has been done upon the question of the inheritance of acquired characteristics and upon the mechanism which causes variations. With regard to the first, Darwin himself allowed some weight to Lamarck's principle that the effects of use and disuse due to environmental influences were in some degree inherited. But Weismann drew a sharp distinction between "soma" and "germplasm", i.e. between the main part of the individual body which was not concerned in reproduction and the hereditary germinal cell; and he held that only the hereditary constitution potentially present in the germ cells, which could not be affected by outward environment, was transmitted in heredity. He concluded that the only inheritable variations were those which took place (quite independently of environment) in the germplasm. Weismann performed a number of experiments to show that external changes in the body were not inherited by individuals in the next generation. A diverting criticism of these experiments may be read in the preface to Bernard Shaw's *Back to Methuselah*, where he refers in light-hearted fashion to Weismann's experiments on cutting off the tails of mice! It may, however, be fairly said that the great majority of biologists today reject the idea that acquired characteristics can be inherited, though there are still notable exceptions to this. The late Professors E. W. Macbride and F. Wood-Jones had been two distinguished Lamarckians of the present age, and a very vigorous defence of the Lamarckian point of view may be found in Wood-Jones's *Habit and Heritage*.¹ It is also noteworthy that a form of Lamarckism and belief in the in-

¹ F. Wood-Jones, *Habit and Heritage* (Kegan, Paul, 1943).

heritance of acquired characteristics underlies the doctrines of Lysenko, which were until very recently the official teaching of Marxist biologists in the U.S.S.R. Most non-Marxist biologists, however, regard Lysenko's ideas as unsound and his experimental results as unreliable, though they have been adopted and enforced by the Russian Communist Party.

While it may be admitted that the evidence against the possibility of the inheritance of acquired physical or anatomical characteristics is very great, the same is certainly not true in the case of mental characteristics. There is in fact a very small body of evidence on which to decide the matter, and it is neither clearly favourable nor unfavourable to Weismann's theory. It may, moreover, be remarked that animal breeders in their actual practice appear to assume a certain belief in the inheritance of acquired characteristics which their experience has not led them to abandon.

The study of the mechanism of inheritance and variation has developed greatly within the last few years. The science of the mechanism of heredity is called genetics, and vast numbers of experiments have been carried out upon it. The beginning of the science really goes back to the Abbé Mendel, who showed that it was possible to work out a scheme of inheritance of definite characters from generation to generation. It is impossible here to go into the details of the genetical theory of inheritance. Short and simple descriptions of it may be found in Schrödinger's *What is Life?* already referred to, or in V. H. Mottram's *The Physical Basis of Personality*.¹ Microscopic research has shown that the characteristics determining both physical and mental attributes reside in the centre of the reproductive cell in minute physical particles called genes, which are situate in that part of the germplasm which is called the chromosome. Not only our personal appearance, such as the colour of eyes or hair, but also mental attributes and personal character in human beings, are determined to a considerable extent by *chemical* compounds situate in the reproductive cells; and Professor Schrödinger shows how physical study and analysis can be applied to them. Moreover, recent advances in the study

¹ V. H. Mottram, *The Physical Basis of Personality* (Pelican Books, 1944).

of radio-activity have shown that it is possible to produce changes in the genes by purely physical means which result in changes in hereditary physical character.

Long before the detailed study of modern genetics and radio-activity, it was known that sudden (and at that time quite inexplicable) changes did appear in individuals in each generation. Whereas the original idea of Darwinism had been that variation was continuous, William Bateson in 1894 first produced evidence of discontinuous variation, i.e. sudden changes. These sudden, 'inexplicable', and sometimes large, changes were called "mutations"; and it was held that such changes, by providing material upon which the process of natural selection could work, were in fact the essential basis of evolution. Such a view was first put forward by De Vries in 1901 as a result of his work with Evening Primroses. More recent study has shown that selective variations, too small to be detectible in a single generation, are capable, when operating on the scale of geological time, of producing all the observed phenomena of biological evolution; and genetics now deals with transmission and variation of characteristics on the great evolutionary scale as much as within individual species or individual pedigrees. Contrary to the earlier views of De Vries and Bateson, it is mainly small mutations which are of importance in evolution. Thus, the discontinuity in the process, though present, is not so great or so dramatic as was formerly thought. Evolutionary change is almost always gradual and almost entirely effected by selection. Still, it is of interest that, just as in the physical field the conception of the Quantum Theory introduces the idea of discontinuity, so in the biological field the fact of mutations introduces it in the process of evolution.

It is now known that mutations are due to changes in the genes as already described. In fact, such changes, which are constantly, though discontinuously, occurring, are sometimes caused by the effects of various types of radiation upon the genes, which produce in the genes a molecular re-orientation. The majority of such mutations are in fact unfavourable to survival and many of them are lethal, i.e. lead to the death of the individual concerned. But a

small minority are favourable and these give rise to individuals which triumph in the struggle for existence and gradually in successive generations acquire dominance in their species. Such is in brief outline the essence of the modern view of the mechanism of evolution.

It will be clear that it raises many profound problems for the Christian—quite apart from the smaller points, e.g. the question whether the fact that progress and even survival depend upon that minority of individuals in every generation which is better adapted to its environment rather than upon the mediocre majority, is really compatible with many of our modern ideas of democracy and the rule of the majority. But quite apart from minor issues of this type, the very nature of the struggle for existence and the elimination of the unfit raises the gravest moral problems concerning the ethics of the evolutionary process, and confronts us with the problems of pain and suffering in nature. Again, the question of the inheritance or otherwise of acquired characteristics must have a bearing upon attempts to improve the physical, mental, or moral standard of humanity. One of the disputed points among biologists has been the extent to which the character of an organism is determined by the characteristics it inherits from its parents on the one hand and by the nature of the environment in which the individual grows up on the other. In application to human social well-being, the significance of this is that if we believe that the vital thing is the germ-plasm, and that no amount of environmental influence can change the essential nature of the individual or his children, then we shall be bound to give first importance in plans for social betterment to eugenic and medical considerations and the weeding-out or curing of stock which is physically, morally or mentally unsound. On the other hand, if we believe that the influence of environment can prove considerably stronger than that of heredity, we shall put our faith primarily in education and in the improvement of housing and other conditions in which the child grows up. In fact, most biologists would hold today that the influence of heredity and environment, “nature” and “nurture”, is more or less equally strong. An individual may

be born with certain characteristics for evil or for mental ill-health which, in a beneficial environment, will always remain latent and never develop. On the other hand, no change in the environment can produce in the individual characteristics which are not *potentially* present in him when he is born. What we are, our personal characters and moral uprightness, depends partly upon what we have inherited from our forbears and partly upon our upbringing: though, as we shall see later, other factors enter into it, too.

4. PROGRESS AND PURPOSE IN EVOLUTION¹

From what has been said in the last section it will be recognized that modern biological research, and particularly the modern science of genetics, has vindicated the general soundness of Darwin's fundamental explanation of the process by which evolution works, i.e. natural selection. As we have pointed out, Darwin himself did not maintain that natural selection was the only factor at work. But the majority of Neo-Darwinians maintain that natural selection, with the added material provided by mutations, furnishes a complete explanation of all the facts of evolution. Starting from this point of view, they attribute the results of the evolutionary process entirely to the blind and fortuitous working of natural selection upon variations produced by purely mechanistic forces. To quote Julian Huxley, "It is as much a product of blind forces as is the falling of a stone to earth or the ebb and flow of the tides."²

Before we accept this point of view, however, there are three aspects of evolution which appear to be overlooked in such a statement, and these we must now consider.

First, whichever way we look at it, the series of develop-

¹ For a complete discussion of the question of purpose in evolution, see C. E. Raven, *Science and Religion* (Cambridge University Press, 1953). Dr. Raven considers that the tendency to interpret biological and evolutionary phenomena in purely mechanistic terms, and to expel every trace of teleological (i.e. purposive) explanation in this field, is due to the prominence of mechanical physics in the 17th and 18th centuries, and to the fashionable trend thereafter to employ a physical approach to biological research.

² J. Huxley, *Evolution: The Modern Synthesis*, p. 576 (G. Allen & Unwin, 1942).

ments which we find revealed in palaeontology, stratigraphy, embryology, and biology generally, may properly be described as cumulative. Thus, the second stage—life—possesses all the qualities of the first stage—inanimate matter—together with certain qualities which inanimate matter does not possess. Again, organisms with nerve centres or brains possess all the qualities of life which simpler organisms possess, plus the added attribute of incipient mind, and at a subsequent stage man possesses all the attributes of life and nervous system which are possessed by earlier organisms, together with other qualities which none of these displays. Thus, the whole process is *additive*, and in this sense we may speak of progress in it. Biologists often prefer to emphasize that the process is one of increasing complexity, but even this involves the additive characteristic. It is not suggested for a moment that the process of evolution throughout geological time is a matter of straight, continuous, unbroken development. We note that one type of organism after another appears, becomes abundant and dominant and then decreases, and sometimes even vanishes, e.g. the graptolites. The process of evolution can in fact be more accurately pictured by comparing it to the stem of a tree, where branches are continually growing out and coming to an end, and even the central trunk of the tree itself is not straight. It is only when we survey the whole process over 2000 million years that we can properly speak of it as one, on the whole, of continuous development. But when we take this very broad view, it is true to say that with all its twistings and vicissitudes the process shows something which may properly be called progress. It is not an entirely blind, kaleidoscopic, and chaotic process with aimless changes leading to no results. Even so well-qualified an expert as Dr. Julian Huxley, who is certainly not prejudiced in favour of a Christian or theistic interpretation, writes of evolutionary progress: "Progress is a major fact of past evolution; but it is limited to a few selected stocks. . . . This limited and contingent progress is very different from the *deus ex machina* of 19th-century thought. None the less, demonstration of the existence of a general trend which can legitimately be called progress, and the definition of its limitations, will remain as a

fundamental contribution of evolutionary biology to human thought.”¹ A recent writer has put forward the following definition of biological progress: “Biological progress consists in biological improvements which permit or facilitate further improvements. Such non-restricted improvement constitutes a very special and very important category of evolutionary process, and assuredly merits a special name, whether we choose to call it “progress” or not. It is the process by which “higher” types come into being, the process by which the upper level of improvement or biological achievement has been steadily raised during geological time.”²

But although J. S. Huxley, in common with the majority of biologists, recognizes the existence of progress in the evolutionary process in some such sense, he will not agree that it is reasonable to deduce, from the existence of this progress, that there is a purpose behind the process. He says, “The purpose manifested in evolution, whether in adaptation, specialization, or biological progress, is only an apparent purpose. . . . It is we who have read purpose into evolution, as earlier men projected will and emotion into inorganic phenomena like storm or earthquake. . . . But if we cannot discover a purpose in evolution, we can discern a direction—the line of evolutionary progress.”³

But the question is, Would natural selection, working upon variations and mutations without any guiding mind or force behind it, have been capable of producing so definite and consistent an over-all progress as we discern in evolution? If we conclude that blind fortuitous unguided forces—here, as everywhere else in our experience—would be incapable of bringing about definite or consistent progress, is this to be regarded simply as the reading of purpose into a situation where the facts do not warrant it? Surely, it would seem more natural to suggest that the recognition of purpose arises out of the very nature of the facts which we have to consider. Where there is progress, order, and

¹ *Op. cit.* p. 578.

² Article in *The Times Literary Supplement*, August 31st, 1951.

³ *Op. cit.* p. 576.

direction, the evidence favours the view that there is a guiding, rational mind at work behind it.

While, therefore, the Christian should not have the slightest hesitation in accepting the facts of evolution and the general theory of natural selection and genetics as a valuable contribution to the understanding of the mechanism whereby evolution has taken place, he cannot possibly agree with the deduction made by many Neo-Darwinians, that this implies a purely fortuitous and mechanistic philosophical doctrine of the evolutionary process. It is because natural selection has become associated with this mechanistic interpretation of biology that it has aroused hostility among some Christians. It must be pointed out that, while a biologist as such is entirely justified in insisting on the biological importance of the factor of natural selection, he ceases to speak as a biologist when he gives a philosophical interpretation of the significance of this. Science in itself is not concerned with the question of the philosophical implications of biological processes or theories. The Christian, approaching the fact of the progress shown in the evolutionary process as a whole, is entirely justified in interpreting it in accordance with the Christian doctrine of creation and the activity of the Holy Spirit. Certainly, there is discernible in the process as a whole an urge or drive, and a vehemence, difficult to reconcile with the pointless and purposeless forces postulated by the mechanistic biologists. It may perhaps be suggested that geologists, whose work brings them more directly into contact with this drive and vehemence, are more aware of it than biologists, whose work is largely confined to the laboratory. Thus, the facts of evolution as a whole at least do not contradict or render impossible the Christian belief that in the evolutionary process we may discern the activity and mind of God and the energy of the Holy Spirit.

This character of drive or urge, this creative force producing new forms of life, new stages of matter, and organisms, which emerge from the very evolutionary process itself, has been excellently described by Conwy Lloyd Morgan under the term "emergent evolution",¹ and both he and S.

¹ Conwy Lloyd Morgan, *Emergent Evolution* (London, 1923).

Alexander¹ have pointed out the philosophical significance of this, showing that it is evidence of progress and purpose in evolution. Lloyd Morgan's conception has considerable affinity with the "integrative levels" of Joseph Needham, though the interpretation which Needham puts upon the matter is entirely different. A further recognition of this urge in the biological world and in evolution was given by Henri Bergson in his book, *Creative Evolution*, where he described it as "élan vital".² All these writers recognize that there is an active power manifested in evolution. Thus, it would be quite untrue to say that there is unanimous acceptance of a purely mechanistic and materialistic interpretation of evolution and natural selection.

We pass now to the second of the three aspects of evolution which we must consider with reference to the question of purpose. This is the existence of a factor of purposiveness in the structure and behaviour of individual organisms. Living organisms, both in their structure and in their behaviour, show a correlation and co-operation between the various parts of the organism, which is a very important factor in biological study and which is difficult to explain without bringing in the idea of directiveness towards a given aim or goal. The various parts of the organism do not behave chemically or biologically as they would do in isolation, but their activity is directed towards the health, maintenance, and propagation of the whole organism. This quality of organization has been emphasized by A. N. Whitehead and others. For example, E. S. Russell points out that "Biology must recognize and accept directive activity as an irreducible characteristic of life", and on this ground he argues that a purely mechanistic conception of a living organism is inadequate. He writes: "The organism is a self-maintaining, reproducing and developing unity and no machine is or can be that." He argues that the method of approach of modern biology is analytical and disintegrative, and that therefore biologists tend to overlook the organism as a whole and not to view the details in their biological

¹ S. Alexander, *Space, Time and Deity* (Macmillan, 1920).

² H. Bergson, *Creative Evolution* (Engl. transl.) (Macmillan, 1912).

relation to the whole. He maintains that when the organism is considered as a whole and its behaviour studied from this point of view, it is impossible to avoid the idea that underlying these characteristics is the general directiveness of its activities, their constant drive towards a normal and specific end or completion.¹

The more fashionable way of explaining this directiveness is by saying that it can be accounted for by the blind and fortuitous working of mechanistic processes of evolution; that is to say, that the co-ordination and co-operation of the various parts and functions of an organism are the result of the working of processes of natural selection upon modifications which have arisen by sheer chance and the consequent survival of those which are most valuable for the adaptation of the organism to its environment. But while the factor of natural selection is undoubtedly of the very greatest importance in this matter also, it is exceedingly doubtful whether pure chance could ever have produced such co-ordinated or beneficial developments as occur in a living organism, and particularly in the latest organisms to appear in the evolutionary processes. That there is a working together, towards a definite end or goal for the organism, of the various factors within it seems difficult to explain on purely and rigidly mechanistic principles. Various other forms of explanation have been attempted in terms, for example, of the "vitalism" of Hans Driesch; but these have now been abandoned. It is in fact outside the scope of science to attempt an explanation, for, as Russell takes care to point out, the function of science is simply to recognize the existence of this directive or purposive factor, without attempting to explain its origin.

D'Arcy Thomson, in his great book, *On Growth and Form*, insists on the same point. "Time out of mind it has been by the way of a final cause, by the teleological concept of end, of purpose or of design in one or other of its many forms, that men have been chiefly wont to explain the phenomena of the living world; and it will be so while men have eyes to

¹ E. S. Russell, *The Directiveness of Organic Activities*, pp. 1-9 (Cambridge University Press, 1945).

see and ears to hear withal. . . . It is a common way and a great way; for it brings with it a glimpse of a great vision, and it lies deep as the love of nature in the hearts of men." And again, "Like warp and woof mechanism and teleology are interwoven together and we must not cleave to the one and despise the other, for their union is rooted in the very nature of totality."¹

One cannot study under a microscope the intricate cellular structure of a living organism, the marvellous inter-relation and working together of the various parts of the body, and the delicate adjustments of the chemical and physiological processes which maintain it, without recognizing that all is not fortuitous or chaotic, but rather ordered towards a definite end or "purpose"—the survival of the organism and the perpetuation of its species.² Could so fine and complex an adjustment be achieved simply by mechanistic chance? Is it not, here again, more reasonable to assume the presence of some guiding and directing power which a similar co-ordination in other fields of human experience would certainly be held to indicate? But, in suggesting that there is an element of "teleology" or "purpose" to be discerned in the design and working of a living organism, we must be careful not to adopt the notion of "teleology" so popular in the 18th century. The "purpose" or "end" is the well-being and survival of the organism concerned, not the benefit of humanity or the common interest of the whole economy of nature. It has already been pointed out that many 18th-century thinkers adopted an anthropo-centric attitude which found providential purpose for the benefit of the human species present in innumerable characteristics of other organisms, and they carried this view to a really laughable extreme. In natural reaction against this, biologists during the last century have refused to admit the existence of any purposive element whatever in biological behaviour. As has been shown above, considerable protest has now been entered against this refusal.

¹ D'Arcy Thomson, *On Growth and Form*, pp. 3, 5 (Cambridge University Press, 1917).

² See Sherrington, *Man on His Nature* (Cambridge University Press, 1940), chapters 3, 4, and 6.

There is an excellent discussion of this whole question in Woodger's *Biological Principles*,¹ in which he draws attention to the need for further analysis of the terms "teleology" and "causation" from the standpoint of their employment in theoretical biology, and he suggests that the supposed antithesis between teleology and mechanism is not sound. "They simply represent two ways of regarding the same feature of the organism . . . both equally important in physiological research" And he refers to a statement by R. B. Perry as follows: "As a matter of fact it is not at all necessary to suppose that teleology is the contradictory alternative to some other hypothesis such as mechanism", and "Life is not purposive by virtue of being emergent or organized; but organization is purposive in the particular case of life by virtue of certain special properties which emerge."² He suggests that the supposed antithesis rests upon three mistakes: insufficient analysis of the notions of teleology and causation; too great haste in trying to bring them into relation; and assuming them to be mutually exclusive. (Reference may also be made to chapters 5 and 6 in his book on the antithesis between vitalism and mechanism, and the theory of biological explanation.)

The Christian should certainly be ready to recognize any facts discovered concerning the mechanism of the living organism; but he is bound to protest against the idea that a purely mechanistic explanation will cover all the facts. We must maintain that the evidence of purpose or teleology as seen in living organisms can only be fully explained by the recognition of some guiding and rational power or spiritual influence at work in the realm of biology, and that the Christian belief that here also the creative Mind of God is to be discerned, directing and controlling the organization of the living body, is a more reasonable and satisfying explanation than the materialistic and mechanistic one.

We now pass to the third aspect of the evolutionary process to which attention must be drawn, namely, the length of time required to produce the astonishing complexity of

¹ J. H. Woodger, *Biological Principles* (Kegan Paul, 1929).

² Woodger, *op. cit.*, p. 450.

individual organs in the higher animals and in man. For example, we may consider the human eye, of the incredible complexity and sensitivity of which Sir Charles Sherrington¹ gives a magnificent description. When we consider the number of cells in the eye and their amazing integration, it seems almost impossible to explain the existence of this organ on an hypothesis of pure chance. (There are about 137 million separate seeing elements spread out in the sheet of the retina.) If we had to account for the appearance and perfection of an organ of this sort by the hypothesis of fortuitous mutations, it would clearly be impossible to do so. It would mean in effect that all these millions of cells and their intricate arrangement would have had to be produced by periodic and chance mutations. Even a recent writer on this subject has said that the chance of two favourable mutations occurring in the same strain without natural selection bringing them together is only one in every 10,000 millions, and that of twenty such favourable mutations is one in (100,000)²⁰. It seems incredible that in the comparatively short period of 2000 million years such a complex organ as this could possibly have been produced by a combination of favourable mutations, as the chances against this are so large. The writer in question, however, goes on to say that this objection is met by the mechanism of natural selection, and claims that the existence of such a highly developed organ is a demonstration of the immense power of natural selection operating over the stretches of geological time. But it would still appear that the chances of sufficient favourable mutations occurring for natural selection to work upon within geological time is very remote. This is a matter of mathematical probability and it would seem clear that in fact the emergence of such an exceedingly complex entity as the human eye is mathematically incredible if it is to be accounted for entirely by unguided and blind chance.

When we consider that the average length of time needed for a generation of the human species is about twenty years and that even in the case of the more remote ancestors of the human species the time required for each generation must

¹ *Op. cit.* pp. 121-131.

have been considerable, it really does appear that sufficient time has not elapsed since their first development to allow of sufficient generations passing to provide the necessary variations and mutations to evolve so complex, well-adjusted, and highly sensitive an organ, as the result of blind chance. The mechanism of natural selection, working upon new development, directed and guided by a rational, creative Mind, would certainly provide this; but pure chance would take aeons longer to effect the same result by mere mathematical probability. The recent advances in our knowledge of the complexity of the higher organisms must surely render more and more unlikely the strict Darwinian mechanistic hypothesis of natural selection,¹ and more and more likely the Christian doctrine that these results have been produced by the creative, purposive activity of the Spirit of God, present in the whole evolutionary process. We have cited the eye as a typical example of this aspect of evolution, but the point is even more forcibly illustrated by the evolution of the brain as a whole, of which again a detailed description will be found in Sherrington's book and in *The Physical Basis of Mind*, and also in J. Z. Young's *Doubt and Certainty in Science*.

Strong pleas for the recognition of design and purpose, both in individual organisms and organs and in the whole process of evolution, have recently been put forward by F. Wood-Jones, by Kenneth Walker, and also, from a rather more partisan point of view, by W. Osborne Greenwood.² Wood-Jones, in *Design and Purpose*, writes: "Having thus accepted the thesis that an astonishing identity in basal structure underlies all matter from the atom to the universe and that uniformity of plan and apparent design are manifested throughout, we come to recognize a vast planned scheme extending throughout all things. Moreover, we see in all matter, both organic and inorganic, a perpetual

¹ It may be mentioned that the criteria of natural selection are constantly changing. Now the selective agent is shortage of food, now frost, now disease, now competition with an invader. How can one expect a consistent evolutionary trend when the selective mechanism is so variable?

² W. Osborne Greenwood, *Christianity and the Mechanists* (Eyre & Spottiswoode, 1941).

manifestation of ordered change; an evolution that embraces both living and non-living matter. We have not even turned aside from the assumption that the progress from non-living to living is one that has definitely taken place, not by any interruption of the great plan but by its own unfolding and by stages of which we have already some realization. It is at this point that we need no great imagination nor do we make any undue demand upon scientific credulity when we detect purpose in the plan, for it appears to be quite definite that the inorganic evolution resulted in the production of an environment uniquely suited for the maintenance of life. It is difficult when we seem to see purpose so clearly at this point to deny an underlying purpose in the whole of the plan."¹ And in *Meaning and Purpose*, Kenneth Walker says that "although the word purpose has been carefully removed from the scientist's official vocabulary, it is a far more difficult matter to eliminate the *idea* of purpose from his mind. He may try to look upon himself as an impersonal engineer who is discovering how a machine works, but even an engineer may find that the idea of purpose obtrudes itself when he starts to study the interrelation of its several parts."²

To enter further into the argument within reasonable space would be difficult.³ The matter resolves itself into the question whether so obvious and purposive a development could take place either in the individual organism or in the course of evolution as a whole, and within 2,000 million years, as a result of blind chance. If we were compelled to argue for the existence of a Creator from this aspect of nature, it would be necessary to consider in greater detail the evidence for and against such a view. But the Christian approaches nature already believing in the divine, rational Creator, and it is at least evident that such a process of

¹ F. Wood-Jones, *Design and Purpose*, pp. 68, 69 (Kegan Paul, 1942).

² K. Walker, *Meaning and Purpose*, pp. 80, 81 (Jonathan Cape, 1944).

³ For a philosophical discussion of the whole question of purpose in nature, and its relation to natural theology, see W. Fulton, *Nature and God* (T. & T. Clark, 1927), and W. R. Matthews, *The Purpose of God* (Nisbet, 1935); also E. L. Mascall, *He Who Is* (Longmans, 1943); and more recently C. E. Raven, chapter VII, "Nature and God", in *Natural Religion and Christian Theology* (Cambridge University Press, 1953).

evolutionary progress, and such evidences of creative purpose within the organism as we have discussed, entirely fit in with this view of nature. Purpose and design indicate the existence of an over-all plan and, as has often been pointed out, we cannot have a plan without a Planner. If we approach the facts of nature with two alternative hypotheses already in our mind—mechanistic natural selection, or divine purpose working through the processes of evolution including natural selection—it can hardly be denied that the latter is the easier to accept.

But if we recognize the hand and mind of God in the whole scope and process of evolution, certain difficulties of a moral nature at once appear, in connection with some of the characteristics of the biological world and the process of natural selection and the elimination of the unfit. To these we must at once turn our attention.

5. THE MORAL SIGNIFICANCE OF EVOLUTION AND THE STRUGGLE FOR EXISTENCE

The primary question which we must consider is undoubtedly the nature of the struggle for existence. From what has been said in section 3 it is quite clear that throughout the whole of the animal kingdom a constant and fierce conflict is raging between individual members of a species and between different species of animals, in competition for food and means of livelihood. One type of organism preys upon another, and within the species those individuals which are weaker or less well adapted to their environment are ruthlessly eliminated. This immediately raises a grave moral issue for all those, Christians and others, who believe in the existence of a rational controlling Mind and a God whose character is Love. How are we to reconcile the existence of this fierce, biological warfare with the loving care of an almighty Father?

In dealing with this question several different considerations have to be taken into account. First of all, it must be recognized that Christianity is in itself a religion of strife and conflict. In contradistinction to Eastern religions, such

as Brahminism and Buddhism, Christianity has a dynamic character and postulates a continuous and ruthless struggle in the moral sphere between good and evil. The Christian attitude towards evil is not one of submission, nor of escape by means of the deliberate elimination of self-consciousness, as in Buddhism, but rather one of fierce opposition and warfare. It is completely in harmony with the Christian faith to suggest that only out of continual struggle and effort in moral conflict can progress and development take place. When William Blake said, "I will not cease from mental fight, Nor shall my sword sleep in my hand", he was expressing the true Christian attitude. B. H. Streeter¹ uses the term "creative strife"; and the Christian would hold that strife is not necessarily destructive and that the struggle against evil is in fact creative. It seems evident that if organisms were not called upon to exert themselves in a constant effort and struggle, they would never undergo that development and adaptation which is necessary for the process of evolution. Even on the pure Darwinian hypothesis, it is still true that the animal which makes no effort to live and abandons the struggle will be eliminated. Similarly, in human life experience shows that the need for struggle and effort calls forth many of the noblest qualities of humanity. We must recognize, therefore, that there is, at any rate in some aspects of the struggle for existence, this principle of "creative strife". On the other hand, it is foolish and hypocritical to deny the existence in nature of a great deal of ruthless cruelty and suffering which is exceedingly difficult to reconcile with belief in a loving Creator. Christians who speak glibly of the whole of nature testifying to and manifesting the loving character of God are often shutting their eyes to these wild and ferocious aspects of animal life. It was perhaps in reaction against such a shallow and facile attitude that T. H. Huxley was impelled into his fervent protest against what he conceived to be the "immorality" of the process of evolution, in which, he said, the conduct of animals was "on the level of a gladiatorial show"; while Tennyson expressed the same idea in verse

¹ B. H. Streeter, *Reality* (Macmillan, 1926).

when he described nature as "red in tooth and claw". It was a very interesting reversal of history when Julian Huxley, T. H. Huxley's grandson, delivering the Romanes lecture at Oxford¹ exactly fifty years after the famous Romanes lecture in which his grandfather made so emphatic a protest against the ruthlessness of evolution, defended a precisely opposite interpretation of the evolutionary process. T. H. Huxley's lecture was entitled "Evolution and Ethics", and in it he argued that the workings of nature are purely a-moral, if not immoral, and that in the course of its development the process of evolution has finally thrown up a being—Man—endowed with a moral sense, who sits in judgement upon the very process which produced him, condemns it as immoral, and must strive with all his might to correct and eradicate those features which offend his moral and ethical sense. In his *Prolegomena to Evolution and Ethics*, T. H. Huxley writes: "That which lies before the human race is a constant struggle to maintain and improve, in opposition to the State of Nature, the State of Art of an organized Polity"; while in the lecture itself he says: "Let us understand, once for all, that the ethical progress of society depends, not on imitating the cosmic process, still less in running away from it, but in combating it." This attitude of T. H. Huxley has more recently been supported by other writers, for instance Sir Charles Sherrington.²

In commenting upon T. H. Huxley's views we must note various modifying considerations. First of all, it was pointed out by Kropotkin that Darwin and Huxley, and other evolutionists, in laying such stress upon individual ruthlessness as a criterion for survival, were ignoring some very important elements in the evolutionary process. Kropotkin published a book under the title, *Mutual Aid*,³ in which he showed that those animals which display the greatest degree of completely selfish predatoriness do not come out best in the struggle for survival. Animals which display a highly developed herd instinct and which work

¹ J. S. Huxley, *Evolutionary Ethics* (Oxford University Press, 1943).

² C. S. Sherrington, *Man on His Nature* (Cambridge University Press, 1940).

³ P. Kropotkin, *Mutual Aid* (reprinted in Pelican Books).

together for mutual attack or defence, subordinating their purely selfish instincts to more altruistic herd instincts, have a greater chance of survival. Thus, Kropotkin was able to show that certain Victorian economists who sought to justify unrestricted individualism and competition, on the ground that it was consistent with the facts and mechanism of evolution, were basing their argument upon an entire fallacy. In nature co-operation within a species is more effective than competition.

Secondly, it has been pointed out by C. E. Raven and others that T. H. Huxley was essentially a laboratory biologist rather than a field biologist, and that, had he had a greater first-hand knowledge of animals in their natural habitat, he would have been less ready to allege that the main characteristic of the biological world was ruthless cruelty and pain. A view completely opposed to that of T. H. Huxley was taken, as has been remarked earlier, by his grandson, Julian Huxley, who maintained that, so far from its being the proper function of mankind to combat and oppose the evolutionary process, its rightful function is to co-operate and collaborate with that process. He argues that T. H. Huxley was influenced by the characteristic Victorian ethical attitude. He writes: "For T. H. Huxley, 50 years ago, there was a fundamental contradiction between the ethical process and the cosmic process. By the former, he meant the universalist ethics of the Victorian enlightenment, bred by nineteenth-century humanitarianism out of traditional Christian ethics . . . and the cosmic process he restricted almost entirely to biological evolution and to the selective struggle for existence on which it depends." He continues: "To-day, that contradiction can, I believe, be resolved—on the one hand by extending the concept of evolution both backward into the inorganic and forward into the human domain, and on the other hand by considering ethics not as a body of fixed principles, but as a product of evolution, and itself evolving."¹ Thus, he argues in favour of an evolutionary concept of the nature of ethics, and holds that we can derive from the very nature of the evolutionary process itself a flexible system

¹ J. S. Huxley, *Evolutionary Ethics*, p. 7 (Oxford University Press, 1943).

of ethics which will be the best guide for individual and social conduct.

The same argument was put forward equally strongly by C. H. Waddington in his book *The Scientific Attitude*,¹ and especially in the Introductory Essay to his symposium *Science and Ethics*.² In the latter he points out that during the last 25 years four lines of thought have converged to attack the previously accepted idea that man's concept of the Good had been "rightly considered to have, or, at any rate, to require, a philosophical justification. . . . This might be deduced from observation, as in the theory of utilitarianism, or revealed by the voice of God or of conscience." The four lines of thought to which he refers are (i) the psycho-analytical; (ii) the anthropological, based on a comparative study of social systems, which tended to show that ethical principles differ extremely from culture to culture and can therefore have no general validity; (iii) the Marxist³; and (iv) the anti-metaphysical thought of the Logical Positivists.⁴

Faced with this situation, Waddington argues that "science can provide a secure basis for ethics by discovering and exhibiting reality to be an evolutionary process tending in a certain direction, action in conformity with which is to be taken as right conduct." He points out that the later products of animal evolution have capacities which include and transcend those of their ancestors, and this he applies to the evolution of social systems. On this basis he criticizes T. H. Huxley's dictum that the method of the cosmic process was the "gladiatorial theory of existence", and argues that we can recognize that quite other, though equally natural, methods of evolution may occur when it is societies and not individuals which are in question. The results of evolution cannot be adequately summarized as an increase in bloodiness, fierceness, and self-assertion. "With our present ideas, the general character of the cosmic process, or, as we now

¹ C. H. Waddington, *The Scientific Attitude* (Pelican Books, 1941).

² *Science and Ethics*, edited by C. H. Waddington (Allen & Unwin, 1942). For a brief criticism of Waddington's views see H. G. Wood, *Christianity and Civilisation* (Cambridge University Press, 1942), chapter II.

³ See Appendix B.

⁴ See Appendix A.

say, of the course of evolution, does not seem so morally offensive that we cannot accept it. . . . We must accept the direction of evolution as good simply because it is good according to any realist definition of that concept. . . . In the world as a whole the really good cannot be other than that which has been effective, namely that which is exemplified in the course of evolution. . . . It is then finally clear that science is in a position to make a contribution to ethics, since ethics is based on facts of the kind with which science deals. And the nature of science's contribution is also clear; it is the revelation of the nature, the character and direction of the evolutionary process in the world as a whole, and the elucidation of the consequences, in relation to that direction, of various courses of human action."¹ Such an attitude constitutes, at any rate in the case of Julian Huxley and Waddington, a definite challenge to Christian ethics; for Christian moral and ethical standards rest upon the conception of divinely revealed fundamental principles which provide an absolute and unchanging yardstick for all human conduct.

Many objections have been raised to Waddington's and Huxley's thesis, both on philosophical and on biological grounds. Philosophically it may be argued that these writers try to prove that the principles which they happen to derive from the contemplation of evolution are morally good by using as a norm the very Christian standards which they have previously repudiated. Thus, in an article in *Nature*,² Waddington writes that "the ethical principles formulated by Christ are those which have tended towards the further evolution of mankind and they will continue to do so." Commenting on Waddington's general thesis, Dr. Leonard Hodgson says: "To this the philosophers reply that science can only deal with what is, and can say nothing about what ought to be, which is the concern of ethics: science can tell us about means to ends, but not about what the ends should be. This criticism seems to me to miss the point. It assumes that the basis of ethics must itself be an ethical judgement, whereas there is surely a respectable philo-

¹ Waddington, *Science and Ethics*, pp. 18, 19.

² Vol. 150, p. 535 (1941.)

sophical pedigree for the position that the ultimate category is that of being. Both for St. Thomas Aquinas and Bishop Butler, for instance, right action is action in accordance with man's true nature. The error in Dr. Waddington's thesis does not lie in his attempt to find a basis for ethics by investigating what is, but in his assumption that nothing is real except what falls within the causal system".¹

The main objection on the biological side is that when we have made every allowance for mutual aid and for other modifying doctrines, the evolutionary process does involve enormous pain and suffering. This must be considered in a separate section.

Before proceeding to consider this fundamental objection, however, we must notice another biological objection strongly put forward by Sir Arthur Keith.² In his book, *Essays on Human Evolution*, deliberately written as a criticism of the thesis advanced by C. H. Waddington, Keith argues that we cannot determine the rules of right behaviour from a knowledge of evolution or reduce ethics to a scientific formula. He points out that Huxley pictured the early evolutionary struggle in the case of mankind as being in the nature of an individual contest—man against man. Darwin, on the other hand supposed that man, before he even emerged from apedom, was already a social being, living in small scattered communities. Evolution, in his opinion, was carried out mainly as a struggle between communities, team against team, tribe against tribe. Inside each team or tribe the "ethical cosmos" was at work, forging and strengthening the social bonds which made the members of such a team a co-operative whole. Thus, in the early stages of human evolution we find both competition and co-operation as constituent elements of the evolutionary process, Huxley's "cosmic process" and "ethical process" working not in opposition, but in harmony. Keith points out that there are therefore two separate ethical attitudes exhibited in evolution—co-operation and unity within the team or tribe, but competition and hostility on

¹ L. Hodgson, *Theology in an Age of Science* (Oxford University Press, 1944), p. 9.

² A. Keith, *Essays on Human Evolution* (Watts & Co., 1946).

the part of one tribe towards another. He then goes on to consider as an example of this the case of Nazi Germany. He remarks that Waddington urges us to assist that which tends to promote the ultimate course of evolution, but that in fact the ways of *national* evolution both in the past and present are cruel, brutal, ruthless, and without mercy. He comments: "Clearly the form of evolution which Dr. Waddington has in mind is not that which has hitherto prevailed; what he has in mind is a man-made system of evolution. In brief, instead of seeking ethical guidance from evolution he now proposes to impose a system of ethics on evolution, and so bring humanity ultimately to a safe and final anchorage in a Christian haven."¹ Keith rightly emphasizes that any attempt to examine the ultimate purpose of existence must explain the evil as well as the good in human nature. His insistence on the conflicting elements, of co-operation and comradeship within the tribe or herd and hostility to all outside the tribe or herd, is similar to the insistence of child psychologists on the two conflicting elements of love and hatred which are manifested in human infants. Keith's criticism indicates that the thesis of Waddington and Julian Huxley is much over-simplified and ignores many relevant facts.

6. PAIN AND CRUELTY IN THE BIOLOGICAL WORLD

One of the most obvious ways in which the views of Waddington and Julian Huxley are inadequate is in their refusal to face up to the problem of pain and suffering and cruelty in nature. It is, of course, possible to be emotionally sentimental about this and grossly to exaggerate the degree of pain felt by lower organisms. C. E. Raven, in his book *The Creator Spirit*², remarks that "for the Victorians the whole issue was coloured not only by the utilitarianism of the age, but by its humanitarianism, by its best as well as by its worst characteristic." He continues: "We have already protested against the misinterpretation of animal behaviour which explains the action of protozoon and insect, of bird and beast by the analogy of human intelligence; a similar

¹ *Op. cit.* p. 13.

² C. E. Raven, *The Creator Spirit*, pp. 119-120 (Martin Hopkinson, Ltd., 1932).

protest must be made against attributing our sensibilities to creatures differently organized." He goes on to quote from Theodore Wood the following examples: "When a crab will calmly continue its meal upon a smaller crab while being itself leisurely devoured by a larger and stronger; when a lobster will voluntarily and spontaneously divest itself of its great claws if a heavy gun be fired over the water in which it is lying; when a dragon-fly will devour fly after fly immediately after its own abdomen has been torn from the rest of its body, and a wasp sip syrup while labouring—I will not say suffering—under a similar mutilation; it is quite clear that pain must practically be almost or altogether unknown." Raven goes on to point out that pain is due in human beings to three chief factors—"to the highly sensitive nervous system which accompanies the development of the higher areas of the brain, to the anticipation of hurt, due to our fore-knowledge of what is to come, and to the sympathy which enables us to share the sufferings of our fellows." Obviously, where these three attributes are absent, as they are in all lower organisms, it is ridiculous to speak of pain in anything like a human sense. Yet, when we have admitted all this and have rescued the problem from the shallow sentimentalism in which it is so often immersed, we have not by any means solved the dilemma. For it would be futile to disregard the blatant examples of fearful suffering caused to man and to the higher animals by various types of organisms in nature.

We have already referred to the Viruses, for which K. M. Smith in his book uses the title, *Life's Enemy*. These ultra-microscopic bodies are the cause of a large number of the worst maladies which afflict not only plants and lower organisms, but also the higher animals and mankind. They are a particular and peculiar instance of the whole class of parasites. In addition there are the varieties of bacteria, some of which, such as those which "fix" nitrogen in the soil, are highly beneficial, but others of which are the agents of diseases almost, if not quite, as terrible as those caused by viruses. Sir Charles Sherrington in a passage of great power in his book, *Man on his Nature*, describes the effects of the

malarial parasite and concludes his description as follows: "This parasitic animal scourges with misery and death entire regions of the Earth's surface which might but for it be happy places. A poet who had seen much of it called it 'million-murdering' and that is true. Its life is the destroying of other lives, and it infects nearly one third of Earth's human population. It is a product of evolution. Evolution has adapted it, complexly, delicately and effectively to kill other lives. Since it requires man for its slaughter, it would seem an evolution of recent date. Its hideous cycle has overcome with 'ingenuity' great obstacles to perpetuate itself." He ends by asking, "What is it then that poisons Nature? If man could answer in one word that word might be, I think, the cruelty of life."¹ And elsewhere Sherrington quotes Aristotle, saying "Evil is more plentiful than good. What is hateful is more plentiful than what is fair." and adds, "Nature is a scene of interaction, and between living things interaction can be co-operation or conflict. Nature exhibits such co-operation but she is burdened with conflict like a nightmare. Unhalting and bloodstained conflict systematically permeates the field of Nature. Beauties it presents, joys it contains, but a blight of suffering infests it. For that reason whole fields of it are sombre tracts to contemplate."² Those who presume to derive their ethical values solely from evolution would appear conveniently to overlook the issues raised by Sherrington; while those Christians who talk of the revelation of God in nature, without qualification and without paying any attention to the complementary factors of pain and cruelty present therein, do no service to the cause of Christianity.

It is only right that we should emphasize the element of beauty in nature to which Sherrington makes a reference in the foregoing passages. No one who is not completely insensitive to beauty can be unaware of or unmoved by the great extent of the beauties of nature. These beauties are found alike in the inanimate and the animate portions of nature. They range from the majesty of mountains and the glories of a summer sunset, the grandeur of the oceans and the

¹ Sherrington, *op. cit.*, pp. 371, 376.

² Sherrington, *op. cit.*, p. 364.

wild energy of the wind, to the superb grace of the movements of animals, the exquisite loveliness of the plumage of birds and the colours of flowers. It is worth remarking that no scientist with any imagination or aesthetic sense can study the world of nature without recognizing this element of beauty, which is really inexplicable from the purely scientific point of view. The construction and bright colour and scent of a flower may be explained biologically and scientifically as being necessary for the continued existence of the flower, inasmuch as they play a vital part in attracting those insects which are necessary for the pollination of the plant concerned. But while this may explain the need for brightness of colour and strength of scent, it is no sort of explanation of why the bright colour and the scent should in themselves be beautiful. The element of beauty itself is something that cannot be accounted for by science, since it is a value which completely eludes the scientific method of investigation. So, if we regard the matter solely from the scientific point of view, we are left with an unexplained element of mystery. Why is a flower beautiful, and why is man gifted with the ability to appreciate this beauty in an abstract way? There seems to be no satisfactory answer to these questions unless we are prepared to admit that the world is the work of a divine Artist who, like all artists, is concerned with the creation and expression of beauty and who has deliberately willed that a being on earth should possess the necessary capacity to appreciate this beauty. But, as Sherrington rightly points out, recognition of this very strong element of beauty in nature, and its corollary that nature itself is the work of a divine Artist, only throws into yet stronger relief the problem presented by the other side of nature—the pain and cruelty, the ruthlessness and bloodiness of the animal world.

7. POSSIBLE ANSWERS TO THE PROBLEM OF PAIN AND CRUELTY IN NATURE

The traditional Christian answer to the problem of pain and evil is twofold. First, it is centred in the Cross of Christ. Those religions, like Mohammedanism, which emphasize the

transcendence of God and present Him as a remote being of ineffable majesty who, having created the world, takes no further active part in its history, can hardly avoid giving the impression that God has neither concern nor sympathy for the suffering of His creation. It is the essence and glory of the Christian religion that it teaches that while God Himself in His eternal majesty created the universe and this world by His divine Will, yet, so far from leaving it to face pain and suffering alone, He Himself voluntarily laid aside His divine majesty and joy and became incarnate in human nature, sharing to the full, as man, all the sufferings and pain of humanity and of the animal creation.

It is very easy for humanitarians to say that God could have produced a world in which there was no pain and suffering and devised a process for the production of animals and of man which did not involve this element. But such a statement cannot be supported by evidence and would therefore seem to be quite unjustified. We know that in actual fact the process of evolution has led to gradual development and ultimately to the production of the human race which, unlike any other part of the animal kingdom, possesses a capacity for conscious, understanding love, for intelligent reasoning and abstract thought, and for the discernment of right and wrong. The process of evolution by which such a being has in fact been produced has necessarily involved the element of creative strife, of conflict and effort and of pain¹ and suffering. But are we to claim that we know better than God, that we could have devised some alternative method of producing the same result which would not have involved pain and suffering? Is it not more reasonable to suppose that God chose to employ this method because He knew that it was the best and possibly the only method available? Nor can we say that, having adopted such a method, He then showed callousness or lack of sympathy

¹ It may be remarked that physical pain performs a valuable biological function in relation to disease by warning the sufferer and so enabling him to take preventive steps in the early stages of the malady. But this does not affect the general problem of the existence of disease and suffering, and cruelty in nature.

towards the animal world which He knew must endure pain and suffering as the price of evolutionary progress. So far from this, He Himself, as we have already seen, entered into history and time, and played His own part in the facing and enduring of pain and suffering and even death. He was not like a staff officer who calmly orders a regiment into action, while he sits comfortably and safely in an armchair at the base. He was, rather, like a gallant Commander, who came down and personally led his men into the thick of the fight.

Moreover, the influence and effect of pain and suffering, patiently and innocently borne, is enormous, far greater than is usually recognized. We have only to consider the results of Mr. Gandhi's actions in this way to recognize what a profound spiritual influence innocent suffering may have; and the brave, heroic, patient and self-sacrificing endurance of pain and suffering by Jesus Christ has had an influence far more profound than anything else could have done on the history of the world. Thus, we learn from the Cross of Christ that pain and suffering are not merely negative in their nature, but can become the instruments and occasions of good. We can even say that if there were no possibility for voluntary endurance of pain and suffering, it would be almost if not quite impossible to demonstrate and prove love, or to achieve great spiritual victories. It may truly be said that pain is a weapon often used by the forces of evil to try to bring about the defeat of good, but that courage and patience in enduring suffering is the means by which good triumphs over evil. Thus suffering is a spiritual battlefield. And do we not all know of the inspiration to be derived from the sight of someone cheerfully and bravely accepting physical pain in disease?

While, however, this is true and while it provides one answer to a part of the problem, it is idle to pretend that it provides a complete answer to the whole problem. It is one thing to say that there may be great value in the voluntary endurance of pain and suffering by conscious beings, and an altogether different thing to argue that the same value exists in the case of a tiny baby suffering from cancer or a sheep whose insides are being eaten away by a tapeworm. In the

case of the tiny baby it is conceivable that such suffering may be the occasion for love, faith, and courage on the part of adult human beings related to it, but certainly it would not seem to have any possible value so far as the infant itself is concerned; while in the case of the sheep afflicted by the tapeworm, the explanation simply does not apply. On the other hand, if it is argued that the existence of cancer and the tapeworm are essential for the process of evolution, this argument would seem exceedingly difficult to sustain on the facts. We seem, therefore, to be forced to the conclusion that, while the struggle for existence, creative strife, conflict, and suffering may in themselves be essential to the working out of the process of evolution, yet in addition to the suffering and conflict which are thus essential, there are other types of pain, suffering, and cruelty present in nature which in no way seem necessary, which have no spiritual value whatever, and which, as Sherrington says, are simply "that which poisons Nature."¹

How are we to account for the presence of these? The second element in the traditional Christian answer is quite clearly that these factors are due to the work of the Devil. Belief in the Devil is in these days extremely unfashionable and would probably be rejected by the overwhelming majority of scientists. But one may well ask how any scientist proposes to give a satisfactory alternative explanation of the facts presented by Sir Charles Sherrington. In the New Testament Christ Himself clearly regarded pain and disease as being not the will of God, but the invention of the Devil. On several occasions when curing diseased persons He gave specific expression to this belief. For example, when He was rebuked for curing on the Sabbath Day a woman who had "suffered with a spirit of infirmity for eighteen years", He replied, "Doth not each one of you on the sabbath loose his ox or his ass from the stall, and lead him away to watering? And ought not this woman, being a daughter of Abraham, whom Satan hath bound, lo, these eighteen years, to have been loosed from this bond on the day of the sabbath?" Here He clearly attributes the infirmity to the direct interference of

¹ C. S. Sherrington, *Man on His Nature*, pp. 375, 376.

Satan. Similarly, when His disciples returned from a ministry of preaching and healing, and reported that both physical and mental diseases were subject to their power, Christ's comment was: "I beheld Satan as lightning falling from heaven." Again and again in the New Testament we find this idea developed—the conception that pain and suffering and disease in nature are at least to a considerable extent not the will of God but the work of the Devil. By "the Devil" we are to understand a *subordinate* spiritual being, created by God but now in rebellion, working against God and trying to interfere with His creative activity. St. Paul in a famous passage speaks of the "whole creation groaning and travailing in pain until now" and "waiting for its redemption", and in this passage it seems clear that he is teaching that, just as man needs rescue from the power of evil, and from temptation to, and the effects of, sin, so the rest of creation also needs redemption from the power of *evil*, i.e. from the pain and suffering inflicted upon it by the malicious interference of those evil powers which may be symbolically referred to as the Devil.

There are certain biological elements which present a curious feature. For example, the viruses obviously fulfil an essential function in providing a transition between the living and the non-living. But is it not a fact that they could have provided such a transition without also possessing those evil characteristics which merit the describing of them as "life's enemy"? Similarly, there are valuable bacteria, and these bacteria fulfil many essential functions in the economy of nature; but there are other bacteria which, instead of fulfilling a useful function, simply cause pain and suffering. Again, there are many insects which are necessary for the breaking down of dead bodies, in order that the earth may not become cluttered up with corpses; but some of these insects also produce in other ways suffering which is in no way essential to their proper work. We are left with the impression of a malign and evilly disposed spiritual force, not sufficiently powerful to frustrate the working out of the fundamental plan and purpose of God, but just sufficiently strong to interfere with details of the biological process and produce

distortions or perversions which cause pain and suffering. Such an interpretation, which is in harmony with the fundamental Christian tradition, meets the facts and provides a way of reconciling the existence of the element of unnecessary cruelty, pain, and suffering in nature with belief in a God of Love. It must be emphasized that the Christian teaching is that these malign spirits, whether as a single entity, the Devil, or as "the spiritual hosts of wickedness", are of an altogether inferior rank and power to God Himself, being, like man, created spiritual beings dependent upon God and existent in time, but possessing a considerable degree of power. Moreover, just as God is unwilling to overrule man's free will in such a way as *forcibly* to prevent him from sinning and rebelling against the divine will, since this would involve the annihilation of moral freedom, so also in the case of these other spiritual beings, created to love and serve Him, but some of whom have revolted against Him, God, though having the power to do so, is nevertheless unwilling to destroy them or to overrule their free will. He therefore allows their rebellion and malign interference to continue until the day when all things are brought into complete harmony with His design, and, as St. Paul foresaw, the animal creation as well as man is redeemed *by Love*, not by force, through the power of God and the work of the Lord Jesus Christ.

Many people, including almost all scientists, are very reluctant to accept any such idea; but one suspects that their reluctance is very largely due to the impression that, by admitting anything in the nature of evil spirits or a personal Devil, they are identifying themselves with the point of view of mediaeval Christendom or of some naive Christians of the present time, who picture the Devil as a figure with horns, hooves, and a forked tail, somewhat similar to the entertaining presentation of him in Weinberger's "Schwanda". In fact, of course, there is all the difference imaginable between the popular mediaeval belief, portrayed in "Dooms" and stained glass windows, and the intellectual doctrine which has been briefly indicated above.

However, those who are unwilling to admit the possibility

that the unnecessary pain, suffering, and cruelty inherent in the biological world is in any way due to such spiritual antagonists of God's plan and will, and are also unwilling to accept in faith the fact of pain and suffering as a mystery, beyond man's understanding yet to be endured through trust in God's love, can only solve their dilemma in one of two ways. They may conclude that nature is either the work of a heartless and a-moral deity, or that it is a "fortuitous concourse of atoms", controlled and impelled by blind mechanical forces. But the Christian need not be pushed back to this position. For he knows that the Incarnation, Life, and Death of Jesus Christ afford overwhelming proof, in the highest way possible on the human level, of God's supreme love and care for mankind. On this and other evidence he has an unshakeable conviction of God's love; and fortified by this he may be content to leave the mystery of pain and suffering unsolved, certain that, since it is permitted by a God whose love has been so clearly demonstrated, it must be necessary and not purposeless. Thus either belief in the work of evil spiritual forces or this trusting faith in God's love afford the only two positive attitudes possible to the problem of pain and suffering in nature. On the whole it can be asserted that the explanation adopted within the New Testament is the former, though belief in the Devil or such evil spiritual forces is nowhere required of Christians, and they are quite free to reject it. Yet, in any case, the *essential* Christian reply to the fact of pain and suffering is unswerving faith in the Love of God and the Cross and Resurrection of Jesus Christ. If the world of Nature is permeated with sacrifice and pain, effort and anguish this is only in line both with human experience that nothing sublime can be achieved without much suffering, and also with the Christian Gospel of self-sacrifice, love, and crucifixion as the only road to new life. If the Cross was the lot of God Himself in Christ, is it to be wondered at that its shadow lies upon His created world of Nature also? ¹

¹ See C. A. Coulson, *Science and Christian Belief*, Oxford, 1955, pp. 107-110.

CHAPTER III

THE NATURE OF HUMAN CHARACTER

I. BIOCHEMICAL FACTORS

IN no department of science perhaps have more far-reaching and important discoveries been made within the last twenty years than in that of Biochemistry and Physiology. Two of the most important fields of biochemical research have been those of human nutrition and of glandular secretions, i.e. the study of vitamins and other dietary factors, and of hormones. These two fields are not unrelated, since the proper functioning of human glands depends to a considerable extent upon an adequate supply of certain essential chemicals in human diet.

The study of the effects of glandular secretions upon health, character and personality has established some very remarkable conclusions. Many of the glands within the human body produce surprising effects if their normal functioning is in any way disturbed. Perhaps the best known of these glands is the *thyroid* gland. In fact, it may be said that the thyroid is the classical example of a gland influencing personality.¹ It is a small gland situated on each side of the throat. Occasionally children are born without thyroids and in this case they remain as "cretins". Such a child not only never becomes adult, but in fact never acquires a personality much beyond that of an animal which shows its wants by grunts and cries. Where the thyroid is under-active the result is "backwardness, slowness of learning to walk and talk, failure to fit into society, slowness of uptake." Characteristics of an adult with mild under-activity of the thyroid are difficulty in mental activity, forgetfulness, lack of concentration

¹ See V. H. Mottram, *The Physical Basis of Personality*, p. 59 (Pelican Books, 1944); also C. S. Sherrington, *Man on His Nature*, and R. G. Hoskins, *Endocrinology* (Kegan Paul, 1941).

and lack of initiative or decision. Other characteristics occur, of a purely chemical or physiological nature, such as obesity, chronic headache, anaemia and sterility. It is thus clear that a defective thyroid exercises a very great effect upon what would normally be referred to as mental or spiritual characteristics of personality. And yet cases of such thyroid defect can be cured by purely chemical methods through the supply of the particular substance which is secreted by the thyroid gland within the human body, namely thyroxin. If this substance is supplied, a change takes place, even in a cretinous child, which, from being a mere sub-human organism, develops a normal human personality. Analogous changes take place in the case of an adult with under-activity of the thyroid. "A few grains, perhaps even less than one grain a day, of desiccated ox thyroid given by mouth will turn an ugly, hairless, coarse-featured, apathetic slovenly being into a pleasant-looking, lively and charming personality."¹ The thyroid gland depends for its efficient working upon the presence of a minute amount of iodine in human diet, and examples of thyroid deficiency may occur where either the diet or the water is completely lacking in this element. Even minute doses of iodine will reduce thyroid trouble almost to a vanishing point. The iodine enables the thyroid gland to manufacture thyroxin which it secretes in the human body and which is an iodine compound of tyrosine and phenol. Both the iodine and the tyrosine come from the food eaten. On this Mottram comments: "It is odd to think that the sort of personality we develop depends upon our obtaining a minute amount of iodine per day—one thousand-millionth or perhaps two thousand-millionth of our body weight per day."² This is a striking example of the relevance of dietetics to Christian ethics and to human conduct and personality! It may well be that the cure for some types of moral wickedness lies not in the philosophical or intellectual sphere, but purely in the biochemical one. Many perversions and defects of human personality can be cured by right and balanced nutrition. This illustrates the wisdom of our forefathers, who recognized the importance of good cooking,

¹ V. H. Mottram: *op. cit.* p. 60.

² *Ibid.* p. 61.

and treated food not as something rather undignified to be hurried through without consideration, but as a profound and delicate art and science of the highest standard. Interesting evidence of the effects of under-nutrition has been supplied from time to time by those who for some reason have had to endure privations in this respect; and weighty testimony was given, for example, of the fact that the difficult political situation in Greece immediately after the end of the war was due not so much to political or economic factors, but rather to under-nutrition, reducing the efficient functioning of the brain and causing lack of self-control. It is not impossible that the true cure for most political troubles is proper feeding and carefully balanced dieting!

In emphasizing the importance of such material considerations as food, Christians are simply following the example of their Lord and Master, who did not regard it as incompatible with His spiritual ministry to provide food for the Galilean multitudes, and who, having raised up Jairus' daughter, immediately commanded that "something be given her to eat".

Other examples of the importance of the proper functioning of glands may be added to that of the thyroid gland. For example, the parathyroid glands which are buried in the thyroid tissue also exercise a great effect upon bodily health and personal well-being. They control the amount of calcium in the blood, and deficiency of this element produces remarkable results. Thus, McCollum writes: "No one with blood containing slightly too low a calcium content and markedly low phosphorus content has a wholesome attitude toward life. The accompanying irritability, lack of agreeableness and lack of serenity must be an important consideration in determining the attitude toward home, school and associates." Mottram adds "Others have given evidence that raising the calcium level in the blood markedly improves the personality in children suffering from too little calcium. Some had developed the typical convulsions followed by mental depression and irrational speech. There was maniacal excitement with screaming, fighting and tearing of clothes. The condition was relieved by parathyroid therapy. Another

physician reports a type of 'personality disorder' in which the parathyroids seemed to play a role. The subjects were so touchy as to fly into ungovernable rage upon the slightest provocation—an unfriendly look or a mildly critical comment. Under treatment with parathyroid extract, supplemented by calcium and sunlight, a striking reformation occurred. Below 8 milligrams of calcium per 100 millilitres of blood and you have an irritable and unwholesome personality—above, and you are a normal human being."¹

Perhaps the most important of the glands, more scientifically called the endocrine organs, is the pituitary, situated between the brain and the roof of the mouth. This gland controls and co-ordinates the activities of the others. The anterior lobe co-ordinates the growth of the bones and the onset of puberty, and over-activity of it results in over-growth and early sexual maturity. Giants are the result of over-activity of the pituitary gland in childhood, and certain sexual abnormalities, including nymphomania, may arise from over-activity of the pituitary. Under-activity of the gland produces precisely the opposite results, and gives rise to great fatness, instead of great height. While the effect of the pituitary gland on personality has been grossly exaggerated in some quarters, there is some evidence of its importance. Over-secretion of the growth hormone seems to be accompanied by intensive living, courage, initiative and forcefulness of character, whereas with waning of secretion there supervenes lassitude, timidity and failure. Of 279 youngsters in whom the pituitary was abnormal, 53 had behaviour problems, such as moroseness, bullying, disobedience, lying, thieving and vagrancy. There was improvement with pituitary extracts, but how much was due to this treatment and how much to psychological handling, cannot be decided.²

Another important pair of glands are the suprarenal, situated above the kidneys. The medulla of these manufactures a very powerful secretion, named adrenalin, which it pours into the blood whenever there is an emergency to meet. If a man is suddenly faced with a situation of danger

¹ *Ibid.* p. 63.

² *Ibid.* pp. 64, 66.

or emergency, the suprarenals inject adrenalin into the blood. This has the following effects: the blood is diverted from other parts of the body to the brain, spinal cord and muscles; its sugar content is raised and the heart beats more forcefully and rapidly. These three things, working together, enable the body to become a much more efficient machine. "The symptoms of unpleasant emotions in man are directly related to the extra adrenalin in the blood. The face blanches, the hairs stand on end, the pupils dilate, the eye-balls protrude, the mouth parches, the heart beats faster and there is a queer sensation in the pit of the stomach. In hyperadrenia, over-activity of the medulla, there is pallor, tremor of the muscles, distressed breathing, sweating, nausea, headache, etc. and extreme nervousness and anxiety".¹ Under-activity of the medulla leads to a "mollycoddle nature", while a mild over-activity leads to a very vigorous, aggressive and full-blooded nature. Destruction of the suprarenal cortex produces anaemia, general languor and debility, and other symptoms of Addison's disease, of which the later characteristics are irritability, irrationality, poor judgement and un-cooperativeness. Similar symptoms are produced by reducing the amount of sodium in the blood.

From the above examples, to which many more might be added, it is evident that the action of the endocrine glands exercises a profound influence over human character and personality. Moreover, this action depends upon an extremely delicate balance of chemicals within the body. It is well known that in the treatment of diabetes, which is a disease arising from glandular deficiency, the amount of insulin (the particular glandular secretion concerned) which has to be injected into the patient must be balanced to the very finest degree, and even a minute overdose will produce very marked results. Thus, while on the one hand it is clear that much alleviation of moral defects might be obtained by proper biochemical treatment, this treatment would need to be of an exceedingly delicate character; and moreover, it has to be recognized that it is not by any means easy to decide from what particular glandular deficiency any set of symptoms arises. Nevertheless,

¹ *Ibid.* pp. 68, 69.

it is clear that glandular considerations are of primary importance in their bearing upon what were formerly regarded as purely philosophical, ethical and moral problems, and that chemical factors of the most material type must enter into any discussion of problems of morals, personality and human character.

This does not seem to have been in any way appreciated by many recent writers on Christian ethics. It may be suggested that there are several directions in which account should be taken of it. First, the fact that our conduct and behaviour, and indeed our very character and personality, may depend upon material factors beyond our knowledge and control, should make us very much more careful and reluctant to pass moral judgement or condemnation upon others than has often been the case with Christians. It may well be that their defects of character and conduct are caused by the inadequate functioning of endocrine glands or deficiencies in diet. In the latter case it would probably be a simple matter to remove the deficiency; but on the other hand, knowledge of it may be lacking in the sufferer, and this, combined with economic and financial conditions, may prevent him from obtaining those foods which are essential to his moral as well as his physical well-being. It is unjust to condemn outright moral faults in another person which may well be due to moral defects in the social and economic structure of the community. On the other hand, for reasons already indicated above, the treatment and cure of glandular defects may be a difficult, intricate and even impossible task, though modern physiology has made such great advances in this field. At any rate, it is clear that no human being, lacking a knowledge of the physiological and biochemical make-up and environment of another person, has any right to criticize or condemn that other person. Many Christians imagine that in order to defend Christian moral principles it is necessary to pass harsh condemnation upon their fellow-men. This attitude entirely ignores the fact that our Lord Himself constantly exhorted us not to judge others and not to condemn them. "Judge not, that ye be not judged; condemn not, that ye be not condemned."

Recognition of sin and evil, and undying hostility and struggle against them do not require that we should be critical and unsympathetic towards our fellow-men whom we may see to be the victims of these things. One of the great values of modern biochemical and physiological knowledge is that it should serve to increase our recognition of the handicaps under which some of our fellow-men may have to labour, and consequently to increase our sympathy with them and our readiness to be patient and to help them.

Again, when clergy are faced in pastoral work or spiritual direction with a person whose character is warped and frustrated by purely biochemical and physiological factors, they cannot hope to rid them of their bad qualities except with the aid of doctors and chemists; and this should bring home vividly the need for co-operation and collaboration between Christians and scientists. It is the duty of the wise priest to be on the alert for, and recognize, cases in which the moral shortcomings with which he has to deal are due to these purely chemical factors; and when he does suspect that this is the case, not to hesitate to enlist the advice and assistance of a qualified physiologist, biochemist or physician. Similarly, it may well be that when the physiologist or physician has effected the cure of the glandular trouble, the help of a spiritual pastor may be needed to restore the character of the person to complete health and integration.

Modern research in this field has clearly shown that it is possible to establish the delicate balance of glandular activity which is characteristic of normal health. To treat an abnormal and distorted character by physiological methods with a view to restoring the person concerned to normal health is in no way to interfere with his character and personality; for a person's true character is really that which manifests itself when his body is working efficiently. If the healing miracles of Christ show one thing more clearly than another, it is that the will of God is full and complete health for every person. When a sufferer from calcium and phosphorus deficiency shows "irritability and lack of serenity", it is not to be supposed that this is typical of that person's true character: it is merely a superficial

distortion imposed upon the real self by something contrary to God's will, and to remove it is to liberate the healthy and potential personality which had all along lain imprisoned by this defect. The Christian ideal for every man is fullness of life, untrammelled opportunity for the complete expression of the true personality, and perfect health of body, mind and spirit. Such an ideal requires for its achievement wisdom, in the right use and grateful enjoyment of food, and in other matters of physiology. True Christian discipline in eating, drinking and other matters of health is not a hysterical asceticism, but a wise self-control and a knowledgeable ordering of all one's diet and one's bodily and physiological life.¹

There are cases in which, acting as the representative of, and with the authority of, the whole Church, a priest may be compelled to impose a discipline upon a fellow Christian for gross breach of the Christian law. Similarly, there are cases in which, in his official capacity, as the representative of and with the authority of the community, a judge may pass judgement in the name of the civil law. But no Christian should take upon himself as a private individual the profound responsibility of passing judgement upon his fellow men. This, however, does not mean that he is to exercise a similar degree of restraint in his own case. The Christian should not excuse moral lapses in himself by an easy use of the argument that he may be suffering from possible glandular deficiencies. It is not our duty to be *over*-harsh with ourselves, and the "scrupulous conscience" is a spiritual disease well known to moral theologians; but the Christian must examine himself and be ready to admit, and endeavour to correct, those faults which a frank and sincere self-examination reveals to him.

It is, however, evident from what has been said above that what we are, our character and behaviour, is not entirely free and unrestricted. Whether we are patient or impatient, whether we are irritable or placid, whether we are vigorous or lazy, whether we are friendly or unfriendly,

¹ See Report No. 674 of the Convocation of Canterbury on "The Spiritual Discipline of the Laity", especially the Appendix on fasting.

may very well depend upon factors beyond our control, or even upon our digestion. The old pun, "Is life worth living? It depends on the liver", is by no means lacking in profound truth. Moreover, these factors may in turn be affected by the environment in which we are born and in which we grow up, and by genetical factors which we have inherited from our parents and ancestors. In the 5th century A.D. a famous controversy broke out between St. Augustine of Hippo and a British monk named Pelagius. Pelagius, a characteristic healthy Briton, took the view that anybody could correct his moral faults by his own efforts, and that if a man pleaded that he was unable by his own strength to overcome his moral faults he was making false excuses. To this point of view Augustine replied that what we are is predestined, and that we cannot in any way overcome our moral weaknesses in our own strength, but only by the grace and help of God. The latter view was carried still further by Luther and Calvin at the Reformation. In this controversy there can be no question that the results of modern physiological research largely vindicate the point of view of Augustine, and show how right the Church was in declaring Pelagianism in its more extreme forms to be contrary to the Christian Faith. For it is evident that it does *not* rest within the power of man to overcome all his bodily and moral defects, nor can he decide what his character is to be. The Church of England Catechism, speaking of our duty towards God and our neighbour, concludes by saying that we should "do our duty in that state of life to which it shall please God to call us". The term "state of life" seems originally to have included only the social and economic condition in which we find ourselves; but it may more truly be applied to the state of health and genetical inheritance which is ours. The Christian ideal, then, is that every man should do his best to serve God with those characteristics and attributes which he happens to possess. If he is born with an incurably over-developed suprarenal gland, it may well happen that as a consequence he shows a great tendency to anger and irritability. This is something which he cannot avoid and which is part of the condition to which he was predestined.

But he should recognize this tendency in himself, do what he can to remedy it by medical and physiological means and, if these are unavailing, should endeavour to control it or to direct its energy into right paths, at the same time realizing that he will never succeed in doing this in his own strength, but only with the help of God and through the spiritual power which comes through contact with God in faith and prayer. St. Paul reminds us that there is a righteous anger as well as an unrighteous one, and a man of this type may be highly effective in social reform, by directing his anger against social injustices instead of against other individuals. Thus, while our personality and our mental and spiritual make-up may be predestined, yet we have freedom *within certain strict limits* to control our actions and to overcome, or wisely to direct, those potential characteristics with which we are endowed. This is why no Christian should give way to the temptation to excuse wrong conduct merely on the ground that he was predestined to have certain defects of character. Finally, the evidence which we have cited of the close relationship between the physiological processes of the body and the well-being of the mind, character and personality, is one notable example of the unity of body and mind. To this subject, however, we must recur in another section, in which we shall examine the relationship of the body to the brain.

It is apparent from what has been said above that Pelagius was wrong not only because he tended to minimize our need of God's help to overcome our faults, but also because he tended to suggest that our will was *completely* free. This is certainly not the case. Both our choice of conduct and our capacity for choosing are limited, first by the fact that we have to choose between a few possible courses of conduct and not between an unlimited number of courses, and secondly because our power to choose is severely restricted by our bodily and mental make-up as well as by our environment and our inherited characteristics. In so far as a modern physiologist would point out such limitations of free will, he would undoubtedly be correct and would, in fact, be in harmony with the traditional stream of Christian thought. If, however, a scientist, confining his study of human beings

to purely scientific and mathematical methods, and thus falsely over-simplifying it, denies the existence of any free will or power of choice whatever in human beings, we must then protest that he is ignoring obvious evidence. For while a moment's consideration will convince us of the severe restrictions upon our power of possible choice, it is equally a universally recognized experience of mankind that every human being has in fact a real power of choice and freedom of will in this limited sense. It is for this reason that no attempt to deny moral responsibility on the ground of physiological influences upon character can be justified. The fact that the existence and reality of choice and free will are commonly recognized by the whole community may be seen in the very conception of law and justice which is common to all peoples; for if a human being had no freedom of choice whatever he would have no moral responsibility and it would therefore be idle to attempt to administer justice or punishment. That the necessity for and justification of law and justice has everywhere and at all times been accepted is overwhelming evidence that the exercise and reality of free will are a primary datum of human experience; and any attempt on the part of scientists and philosophers to ignore or deny this universal evidence is totally unjustifiable. It is, moreover, recognized by the law itself that certain human beings are "*non compos mentis*", i.e. that they are insane and therefore not responsible for their actions. The fact that such a defence can be pleaded successfully in a court of law in the case of those clearly suffering from mental illness implies that it is equally recognized that a human being in a normal state of bodily and mental health is morally responsible for his actions. While it is true that in an enlightened age physiological and glandular defects would in suitable cases be taken into account in a civil court of law, just as they ought to be in the moral judgements of the Church, it is none the less true also that they could never be accepted as a ground for denying any degree of moral responsibility whatever, or for denying the reality of human free will. We shall discuss this matter further in the next section in the light of recent research upon the physics and physiology of the brain.

2. PHYSIOLOGICAL FACTORS

Within the last fifteen years some very interesting and significant results have been obtained from an operation upon the brain which is known as Pre-frontal leuchotomy. The essence of this operation is that the surgeon cuts large bundles of the white conducting nerve fibres connecting the front part of the brain with the rest of the brain. (The particular fibres concerned form a band known as the front-thalamic tract, which connects the pre-frontal area of the frontal lobe with the thalamus.) The pre-frontal part of the frontal lobe of the brain is concerned with thought, but its precise functions are obscure. The Report issued by the Board of Control in 1947 on *Pre-frontal leuchotomy in a thousand cases*, states: "It is very difficult to establish the relationship between such aspects of thought as imagination, intelligence and self-consciousness on the one hand, and any given part of the brain on the other. The thalamus has functions which are better known—they are concerned with feeling and emotion. . . . Crudely described, the purpose of the operation is to break the connection between the patient's thoughts and his emotions. It is to relieve mental tension, to take the sting out of experience and thus to favour improvement or to hasten recovery from mental disorder. That, at any rate, seems to happen in successful cases. Nothing so devastating occurs as an absolute severance of thought from emotion; if it did, the patient would become completely dull and unresponsive."¹

The operation of pre-frontal leuchotomy is used in cases of mental disorder, such as melancholia or schizophrenia. It does not remove the patient's delusions, but it eliminates the emotional tension associated with them. The patient ceases to care about ideas of dirt or infections or hallucinations and delusions, and can therefore take up everyday activities without anxiety. The operation is by no means always successful. In some cases there is no lessening or dulling of emotion. There appears to be a lessening of preoccupation

¹ *Pre-Frontal Leuchotomy in 1,000 Cases*, p. 5 (H.M.S.O., 1947).

with self, but it is uncertain whether the normal consciousness of self is interfered with.

A case in which the operation may be of benefit is that of sleepy-sickness, which may leave behind it great mental irritability and revolt against the ordinary conventions of society. This perversion can be removed by pre-frontal leuchotomy. The patient's personality changes and he often becomes quiet and reasonable and remains so. Professor Wilder Penfield states that "The large sheet of cortex which covers the front part of the brain seems to be utilized by man when he is thinking of new plans and seeking greater insight into life's problems. . . . During the last few years psychiatrists have made the operation of leuchotomy fashionable as a cure for the anxiety of some patients who are insane and for others who are not so insane. This operation, which amputates both frontal lobes, does not produce loss of memory because other parts of the cortex are used for the recording of memory and no interference is produced with sensory perception nor with motor control. But the luckless individual does forfeit capacity for planned initiative. He may have gained peace of mind but he has lost a type of insight that is difficult to define."¹ On the other hand, the Board of Control Report issued in 1947 states that "it is very difficult to say definitely that leuchotomy renders the patient dull and destroys his initiative. Where a schizophrenic is left dull after the operation, it may be the result of the operation itself; but it may be a symptom of schizophrenia remaining unrelieved by the operation; or the dullness may be the normal reaction of a person now older returned to a family changed by time to different living and missing friends and acquaintances."² The Report states that evidence certainly gives a general impression of a lessening of emotional tension. "In some cases patients were described as dull, slow, inert, docile or submissive after the operation, but others were described as happy, cheerful, completely carefree, confident and content. In a number of cases the patient is said to have made an

¹ Wilder Penfield, in *The Physical Basis of Mind*, ed. P. Laslett, pp. 59-60 (Basil Blackwell, 1951).

² *Op. cit.* p. 19.

absolute recovery." It is thus apparent that the evidence of the results of this operation is at present insufficient to justify any final conclusions from it. But it is also evident that this operation may in certain cases cause a radical change in the personality and moral sense of the individual concerned. It is one of the clearest and most arresting indications of the close and intimate connection between the structure of the brain and human personality. Even if, as is suggested in the Report cited above, the changes are mainly in connection with the emotions, this in itself has a significant bearing upon the question of personality, since emotional intensity is an important aspect of the character of a particular human being.

This line of research is, however, by no means the only or the most general work which has recently been carried out upon the structure of the brain and its relation to thought, self-consciousness and human personality.¹ The work initiated by Sir Charles Sherrington, and carried on by such workers as Lord Adrian, Professor Le Gros Clark and Professor J. Z. Young, has afforded a vast amount of new information on the whole matter. Adrian has investigated the physical and chemical changes which occur in the brain when a human being is thinking. "There are about 10,000 million nerve cells in the brain, and they are connected by an interlacing network of threads so that a cell is rarely active without influencing its neighbours. The essential activity seems to consist in a sudden change in the cell surface which allows a momentary escape of some of the molecules. This surface change can be repeated at very short intervals so that the cell may become active and inactive as often as fifty times a second, and each time it becomes active an impulse will pass out from the cell to its neighbours or farther afield to other parts of the central nervous system. . . . Whenever nerve cells or fibres are active, they produce electrical effects—rapid changes of potential corresponding to the changes in the surface membrane. The electrical changes are very small, and they can only be detected by placing electrodes in contact with the cells or with

¹ For a fine account of this work up to 1940, see C. S. Sherrington, *Man on his Nature*, chapters VII, VIII and IX.

the fluids and tissues close to them, but nowadays it is a simple matter to amplify them until they are large enough to be recorded photographically. . . . Records of these electrical changes show that the messages which are sent into the brain from the sense organs are made up of repeated impulses in the nerve fibres. . . . So when we see a light or hear a sound, the first thing that happens in the brain is the arrival of a great many nerve impulses." The brain surface shows constant electrical oscillations, but when the individual is asleep, these die down. In the case of a person sitting with eyes closed and attention relaxed, there is a regular rhythm in the nerve cells over a considerable part of the brain surface, but this stops if he opens his eyes and looks at something or if his attention is concentrated on a problem. "Ordinary casual thinking does not involve widespread changes in cell activity, but really concentrated thinking does."¹ All this investigation provides valuable and interesting material for philosophical interpretation, since it clearly sheds light upon the nature of perception. A concise statement of this evidence is given in Adrian's Waynflete Lectures of 1946.² It may be added that the connection between brain activity and consciousness has been somewhat clarified by evidence concerned with the loss of consciousness which occurs in an epileptic fit. In an epileptic fit the brain is violently active, but the cortex shows electrical activity which implies that large areas are active in unison. This appears to suggest that if we are to be conscious, the cells of our cerebral cortex must not all be engaged in the same kind of activity, though it is clear that for consciousness it is not necessary that the whole of the cortex should be capable of differential activity. The mind can still function with abnormal waves in much of the cortex. What seems to be necessary for consciousness is that some part of the cortex should be free to react to the incoming messages from the sense organs

¹ "What happens when we think" : E. D. Adrian, in *The Physical Basis of Mind*, ed. P. Laslett, pp. 7-10 (Blackwell, 1951). This collection of short talks by various eminent authorities has been utilized here as a convenient brief summary of the present state of knowledge in these matters.

² E. D. Adrian, *The Physical Background of Perception* (Oxford University Press, 1947).

and to those handed on from other parts of the brain. Evidence of this type is of very great interest as showing how the mechanism of the nervous system and the brain works; the means by which we perceive the external world; the way in which our sense perceptions are transmitted to the brain, sorted out and co-ordinated; and the way in which responses to them are generated. But such evidence as this, while explaining how certain factors may produce lack of perception or limited consciousness, does not give us much information about the processes of thought or the nature of human personality. It is when we come to consider how the physiological evidence collected within the last fifteen years bears upon the question of the relation of "mind" to "brain", and how thinking takes place, that we find a great measure of disagreement among the most eminent authorities. Thus, Sherrington has said, "The physical basis of mind encroaches more and more upon the study of mind, but there remain mental events which seem to lie beyond any physiology of the brain." And again, "Aristotle, 2,000 years ago, was asking 'How is the mind attached to the body?' We are asking that question still."¹ Earlier he had written, "I have therefore to think of the brain as an organ of liaison between energy and mind, but not as a converter of energy into mind or vice versa. We have, it seems to me, to admit that energy and mind are phenomena of two categories."² Later he continues, "I have been trying to outline as an item of Nature-study the growth and extension, and then the restriction and purification of the applications of this non-sensual concept. When it has been stripped of untenable pretensions, what remains to it? There remains then a residue inalienably its own. A residue more precious than any of its mistaken ambitions. A residue valuable beyond expression, for language, its own half-perfected instrument of expression, is not adequate to express it to the full. A residue which is the source of all its splendid 'realities' as well as of all its dreams. A residue which contains *all* the 'values'—for space is

¹ Introductory chapter by C. S. Sherrington in *The Physical Basis of Mind*.

² C. S. Sherrington, *Man on his Nature*, p. 318.

irrelevant to 'values'. In a word, the conscious 'I', called in the abstract, 'mind'."¹

Again, Adrian writes, "The part of our picture of the brain which may always be missing is, of course, the part which deals with the mind, the part which ought to explain how a particular pattern of nerve impulses can produce an idea; or the other way round, how a thought can decide which nerve impulses are to come into action." As he points out in an earlier work, "Large parts of the brain can in fact be destroyed without the mind reflecting any obvious change. . . . It is true that injury or disease must avoid certain critical regions of the brain if it is to produce no disturbance of the mind, but it can be none the less extensive. . . . The human mind is, therefore, anchored to the brain and not to any other part of the nervous system or the body, and if the brain survives the mind is not impaired."²

Dr. Russell Brain states: "Is it likely that physiology will ever throw any real light upon the relationship between the brain and the mind? I believe that, working in conjunction with psychology, it will. . . . My guess is that in the nervous system we are looking at the threads while with the mind we perceive the patterns, and that one day we shall discover how the patterns are made out of the threads."³ W. Penfield, having referred to the fact that a patient may be made, while fully conscious, to perform certain automatic reactions by stimulating the cortex of the brain with a gentle electrical current, comments: "When a patient is asked about the movement which he carried out as the result of cortical stimulation, he never is in any doubt about it. He knows he did not will the action. He knows there is a difference between automatic action and voluntary action. He would agree that something else finds its dwelling place between the sensory complex and the motor mechanism, that there is a

¹ *Ibid.* pp. 347, 348.

E. Schrödinger also appears to support this point of view when he says: "The observing mind is not a physical system, it cannot interact with any physical system." (*Science and Humanism*, p. 53.)

² E. D. Adrian, *The Physical Background of Perception* (Oxford University Press, 1947), p. 6.

³ "Speech and Thought" in *The Physical Basis of Mind*, p. 54.

switchboard operator as well as a switchboard."¹ Similarly, a paper published in *Philosophy* (October, 1940) by Foster Kennedy, on "The Interrelationship of Mind and Body", defends both the existence of the mind and also its association with the body in a unified whole.

On the other hand, E. T. O. Slater points out that the brain is responsible for the conscious aspects of emotion, but that emotions have also unconscious or only partly conscious aspects and are under the control of nerve centres outside the brain, and of bodily organs, especially certain glands; and he adds that differences in personality between one man and another may lie as much in the organization and regulation of these glands as in the brain itself. But he continues: "I think it very probable that our ideas will have to be completely reorganized. The ambiguities and contradictions which are involved when we make use of such words as 'consciousness', 'mind', 'free will', which now seem so insuperable, may yield to quiet investigation or may be shown to be but verbal and the result of our asking ourselves the wrong sort of question. What we already know does, however, suggest that the relationship between body and mind is so intimate that they are best regarded as one."² The statement by Dr. Slater in the last sentence is in line with the writings of certain modern philosophers, and particularly with Professor Gilbert Ryle in his book, *The Concept of Mind*.³ Professor Ryle regards the concept of the mind or the self, when set in contradistinction to the body or the brain, as being an unfortunate legacy from the dualism of Descartes, and speaks of them as being "the ghost in the machine". He argues that our philosophical categories are wrong and that what he describes as "the Cartesian myth" has no justification in fact. Professor Ryle would maintain that he is in no way supporting the philosophy of Behaviourism put forward many years ago by Watson and his colleagues in America, which attempts to give a severely

¹ "The Cerebral Cortex and the Mind of Man" in *The Physical Basis of Mind*, p. 64.

² "Consciousness" in *The Physical Basis of Mind*, p. 44.

³ G. Ryle, *The Concept of Mind* (Hutchinson, 1951).

mechanistic and materialistic interpretation to every side of human behaviour and character, including thought and spiritual activities.¹ In a short section in *The Physical Basis of Mind* Professor Ryle writes: "The umbrella-titles 'Mind' and 'Matter' obliterate the very differences that ought to interest us. Theorists should drop both these words. 'Mind' and 'Matter' are echoes from the hustings of philosophy and prejudice the solution of all problems based in terms of them." In the same symposium A. J. Ayer argues in true Logical Positivist fashion² that the whole problem is purely a linguistic one, a matter of the right use of language. He says, "My conclusion is, then, that mind and body are not to be conceived as two disparate entities between which we have to make, or find, some sort of amphibious bridge, but that talking about minds and talking about bodies are different ways of classifying and interpreting our experiences. I do not say that this procedure does not give rise to serious philosophical problems; how, for example, to analyse statements about the thoughts and feelings of others; or how far statements about people's so-called mental processes are equivalent to statements about their observable behaviour. But once we are freed from the Cartesian fallacy of regarding minds as immaterial substances, I do not think that the discovery of causal connection between what we choose to describe respectively as mental and physical occurrences implies anything by which we need to be perplexed."³ Viscount Samuel, however, in the same symposium entirely disagrees with the line taken by Ayer and Ryle, and supports Sherrington, Penfield, Le Gros Clark and Adrian in their use of two categories, mind and brain.

This great problem of the relation of mind and brain is quite evidently of fundamental importance to the Christian faith. For that faith is rooted in the conception of human personality, of the reality of free will and of the existence of the conscious, rational self. At the same time, it would be a

¹ For an account of the historical basis of the mechanistic interpretation of biological facts, and its relation to 18th century physical ideas, cf. C. E. Raven, *Science and Religion* (1953).

² See Appendix A.

³ *Op. cit.* p. 74.

mistake to imagine that the validity of the Christian faith or of its conception of the human spirit, of ethical conduct or of moral responsibility, is in any way bound up with a particular philosophical doctrine concerning the nature of man. Ryle has done good service in drawing attention to the fact that we have become so accustomed to the use of categories, "mind" and "matter", as they were defined by Descartes at the beginning of the 17th century, that we tend to think that the Christian faith can only be presented in terms of these categories. This is entirely untrue. Descartes, though himself a Christian, was primarily concerned to formulate a philosophy suitable for the mathematical physics which was arising in his day; and, as we have already said, earlier in this book, he deliberately placed in the primary category such "material" properties as were amenable to mathematical treatment, relegating all others to a secondary category of mental properties. Such a procedure has in fact produced results which raise considerable difficulties both for philosophy and for the Christian religion, and has encouraged the biological mechanistic interpretation of phenomena which characterized some 19th-century scientists. But the traditional Christian philosophy of the Catholic Church has been very different from this. For example, the Aristotelian philosophy of St. Albert the Great and St. Thomas Aquinas used entirely different categories from "mind" and "matter", and avoided many of the difficulties which have arisen from this Cartesian dualism. On the relation of St. Thomas Aquinas' thought to that of Descartes, reference may be made to the works of Professor E. Gilson, while a statement of scientific knowledge in terms of the entirely different categories of Thomism is to be found in *The Degrees of Knowledge* by Jacques Maritain.¹

But we can go farther back than the Middle Ages: for it has been pointed out by Professor H. Wheeler Robinson² that the ancient Hebrews and, indeed, the Jews in New Testament times, had a conception of human personality

¹ J. Maritain, *The Degrees of Knowledge* (Geoffrey Bles, 1937).

² Cf. H. Wheeler Robinson, *Inspiration and Revelation in the Old Testament* (Oxford University Press, 1946).

which entirely avoided the dualism of body and mind. To the ancient Hebrews a human being was a single co-ordinated self. Into his body there was breathed by God the "ruach" (breath or spirit) which activated the whole being of the man. A vivid illustration of the characteristic Hebrew psychology is to be found in the famous conception of the Valley of Dry Bones in Ezekiel, chapter 37, where the inert bodies become living, thinking, active human beings as soon as the breath of God enters into them. But whether it were body or brain or mind, the whole was pictured as dependent upon the activity of God and no separation was made between the body and the mind. Thus, Ryle is in fact urging something like a return to a modified form of the ancient Hebrew psychology which is the psychology also of the New Testament where it has not, as in the case of St. Paul's epistles, been influenced by Greek philosophical thought; and therefore it would be wrong to imagine that the contentions put forward by Ryle are necessarily hostile to, or incompatible with, the Christian doctrine of man. In fact, it must be admitted that recent research on the chemical and physiological influences upon human character and personality clearly indicates the essential unity between the body and the mind. While we may admit, with Sherrington and others, that the question of their precise interaction and relationship is complex and has not yet been solved, it cannot be denied that the whole trend of modern medical and scientific research has been to show the close and intimate connection between the two, the essential unity of the whole human being. To speak of a mind or self apart from, or in isolation from, the rest of the body is to speak against the facts. The Greek notion of a disembodied spirit, or of an alien spiritual portion of the personality indwelling the body as a stranger remote from it, is completely incompatible with present-day knowledge. The picture of the soul as some spiritual entity, living in but not of the body, is also untenable.

It may seem that this raises grave and menacing difficulties for the Christian idea of the survival of the personality after death. But this is not really the case. On the contrary it is not the Christian religion but the Greek philosophies,

such as Platonism and Neoplatonism, and the Eastern religions, with their idea of a diffused impersonal spiritual essence, which are irreconcilable with the facts of modern physiology. The Christian religion, like the Hebrew religion before it, fortunately never became committed to this Platonic or Eastern view. On the contrary, at a time when most pagan thinkers and philosophers were emphasizing the conception of the immortality of the soul in isolation from any bodily substance, the Christians defended the traditional doctrine of the resurrection of the body, and this became enshrined in the Apostles' Creed, even in the uncompromising form of the resurrection of the flesh (*σαρξ*). While it is true that some medieval theologians spoke and wrote as if the body which was to rise again were the actual body of flesh and bones which existed during earthly life, yet such an interpretation of the phrase "the resurrection of the body" was clearly not held by St. Paul and other New Testament writers; for in the 15th chapter of I Corinthians St. Paul distinguishes emphatically between the present material body, consisting of chemical atoms and molecules, and the resurrection body, which is of different substance. Yet none the less he says very definitely that a human being, even after death, cannot exist without a body, and that this body, whatever may be its constituents, will correspond to the present earthly body and will form a definite part of the future risen human being. Moreover, he also clearly suggests that in some way there is a very direct and immediate connection between this future body and our present physical body. While he eliminates any idea of the actual regeneration of the present physical body, he recognizes that a human personality cannot exist at all without a body. In fact, what the Christians were contending for when they defended the doctrine of the resurrection of the body was precisely the survival of the whole, self-conscious personality after death; and they recognized that such survival of self-conscious personality was unthinkable apart from a body. The pagan philosophers and the Eastern religions jettisoned the body, and consequently tended more and more to reject the idea of continued individual personal or self-conscious existence in the future life.

Without a body the human self or personality is incomplete. Not only is it deprived of any means by which to translate its thoughts, desires and will into action, but also it is unable to communicate with others or to express itself in any way. The recent trend of physiological research admittedly raises many problems for the Christian doctrine of the future life; but although, on account of our entire ignorance of the details of that future state, we can never hope to find a complete or detailed answer to these difficulties, yet the doctrine of the resurrection of the body is infinitely more acceptable than the doctrine of the immortality of the soul.

The word "soul" is another term, the use of which might well be abandoned in view of the ambiguities which surround it. This is an example of the danger of using language carelessly or without clarity, and Logical Positivists, such as Ayer, have at any rate rendered modern theologians a considerable service by warning them of the dangers of the misuse of language and the pseudo-problems which may arise as a result of this misuse.¹ Not that this is a new idea in Christian thought, for St. Thomas Aquinas in his doctrine of Analogy of Proportionality and Analogy of Attribution was concerned with precisely the same danger of the misuse and misinterpretation of linguistic terms in theology and philosophy.

If we are to reject the use of the word "soul", what we should substitute in place of it is probably the word "self". By this we must mean a self-conscious, rational human personality. It is only when modern physiologists or physicists deny the existence of self-consciousness altogether, or the existence of reason or free will, that their position becomes quite incompatible with all Christian ideas. Few physiologists have gone so far as this. It is quite true that Pavlov in his experiments on conditioned reflexes is sometimes thought to have attempted to explain the behaviour of human beings entirely in automatic, mechanistic terms; but actually Pavlov's experiments concern such reactions as may properly be considered to be those of the mechanism of the

¹ See Appendix A.

nervous system and the brain, without any relationship to the conscious will. They covered deliberately only a restricted field, and Pavlov himself never admitted that they justified a mechanical, mechanistic or behaviouristic interpretation of human personality. In so far as some of his experiments relate to the capacity for learning and memorizing, they may be thought to have touched upon an aspect of human personality: but, although there have been considerable developments in the study of the mechanism of memory, no light appears to have been shed by recent research upon the nature of abstract, speculative thought, or moral or aesthetic values. J. Z. Young in *Doubt and Certainty in Science* gives a splendid and most interesting description of recent advances of this type; but, unfortunately, when he attempts a philosophical consideration of the implications of the facts which he records, he misuses certain ideas of Ryle and of the Logical Positivists in such a way as almost to commit himself to a mechanistic or behaviouristic interpretation of them. To investigate in detail the precise mechanism by which the nervous system works, the manner in which sensory reactions are transmitted to and sorted out by the brain, and even the way in which memories are stored up, is in no way to cover the problem of human personality. This is only a study of the machinery of the human brain.¹ It does not in any way explain the ordinary and universal experience of self-consciousness, moral conduct and abstract thought. Indeed, J. Z. Young himself, in the last page of his book, appears to recognize this. He says that some of the considerations he puts forward may be the result of excessive preoccupation throughout his lectures with the subject of communication. He continues: "But I should like to emphasize that to communicate is not our whole nature. It is our means of getting a living as a social animal, but it is only a means, not living itself."²

¹ See the chapter "Persons and Things" by Donald Mackay in *Science and Faith Today*, edited by John Baillie (Lutterworth Press, 1953).

² J. Z. Young, *Doubt and Certainty in Science*, p. 163 (Oxford University Press, 1951).

In the course of his book Young devotes some space to the similarity between the working of the brain and the memory and the working of very complex modern Calculating Machines.¹ This subject has recently been discussed in a broadcast symposium by physiologists and philosophers, and one of the contributors to this symposium, A. M. Turing, has stated his views at considerable length in a paper entitled "Computing Machinery and Intelligence".² In this paper Turing sets up a number of Aunt Sallies which he proceeds with great pleasure to demolish. He considers the question "Can machines think?" and begins with a definition of the term "machine" and the term "think"; but when he seeks to answer the question (which he has phrased in a particular way to suit himself) he tries to rule out the possibility of a negative answer by considering possible objections to an affirmative answer to the question and demolishing them one by one. It may reasonably be claimed that this is a somewhat arbitrary procedure. A rather entertaining reply to Turing's contentions is contained in a subsequent article in *Mind*, by L. Pinsky,³ under the charming but none the less suggestive title, "Do machines think about machines thinking?" Both of these papers treat the problem in a somewhat light-hearted manner; but even so the question they raise is of considerable interest and significance. Is it, in fact, possible to construct a machine not only capable, as complex calculating machines already appear to be, of memorizing and of making mistakes and rejecting the wrong answers with considerable violence, but also of abstract thought? If indeed it were possible to do this, that might suggest that the element of personality and self-consciousness which is characteristic of a human being was explicable in terms of the mechanism of the brain, by analogy with the mechanism of a calculating machine. But the evidence does not justify any such con-

¹ A short and simple account of modern calculating machines and their analogy to the human brain can be found in W. Sluckin, *Minds and Machines* (Pelican Books, 1954).

² *Mind*, Vol. LIX, p. 433, October, 1950.

³ L. Pinsky, *Mind*, Vol. LX, p. 397, July, 1951.

clusion.¹ Moreover, a calculating machine lacks precisely the element of individuality and character which is the essential attribute of a human being. All machines are "tools" of a human brain, designed by men for specific purposes, and "trained" and instructed by their makers. We are thus led to conclude that, while the modern advances in physiological research raise matters of profound interest and very considerable difficulty for Christian theologians, and while the evidence of the influence of the nervous system and the structure of the brain upon human personality may compel us, as in the case of the influence of glandular secretions already discussed, to re-formulate many of our definitions, and even modify our statement, of Christian ethics, yet none the less nothing that has been found out can destroy or overthrow the fundamental Christian view of human nature or of self-conscious moral and intellectual responsibility. It is clear that the particular structure of our brain influences our personality, and that diseases, disorders, or malformations of the brain or the nervous system may distort and warp the normal healthy human character. Yet, although we must recognize and allow for the effects of these things, that is very far from saying that they reduce the normal human being to a mere automaton or machine, devoid of free will and unable in any way to influence his conduct or his choice.

Finally, we must remember, as has been said earlier in this book, that the scientific method is only one of several methods of investigation and that it is by its very nature subject to certain definite limitations. It can only give us such facts as are obtainable by its own methods and can give us no indication of other facts which by their nature are not discoverable by these methods. It is very important that we

¹ On this see the excellent article by M. Scriven, "The Mechanical Concept of Mind", in *Mind*, Vol. LXII, pp. 230-240, April, 1953. Some interesting suggestions are made by J. Z. Young in his "William Smith" lecture to the Geological Society on the possible use in palaeontological research of "morphometric machines." (*Q.J.G.S.*, Vol. CX, Part I, October, 1954, p. 8). "Such machines might measure, record and compare the significant attributes of fossils." He suggests they might even decide what is significant! But he adds: "All machines are artefacts, ultimately instructed by human needs." See also D. M. Mackay, "Mindlike Behaviour in Artefacts," *British Journal for the Philosophy of Science*, Vol. II, No. 6, August, 1951.

should remember this when we are concerned with problems of human personality. The investigation of the body and brain by the methods of science can give us facts about those elements in a human being which are expressible in scientific terms¹ and are discoverable by weighing and measuring, by analysis and by the rest of scientific technique. But if we imagine, as do behaviourists, that we can obtain a complete and satisfactory picture or knowledge of the whole human being by the methods of science alone, we are in fact sadly mistaken. And this is apparent from the fact that the behaviourist's conduct, when dealing (for example) with his own wife or fiancée, is quite obviously not based upon the conception that he and she are rather complicated types of human machines!

3. PSYCHOLOGICAL FACTORS

In the last two sections we have discussed the bearing of modern advances in biochemical science and in physiological science upon the nature of human personality, freedom of the will, moral responsibility and the existence of reason and the soul. But within the last fifty years an equally important development—if not a more important one—has occurred in the science of psychology.

It would be impossible in a book upon the relation between religion and science in general to include any *full* treatment of the question of the relation between psychology and religion. Precisely because, as its name implies, the science of psychology is primarily concerned with the human personality and the origins of human ideas, its relationship with religion is peculiarly close and important. To discuss this relation would certainly require a complete book in

¹ Here, as in other places, we must recognize that two different descriptions of things or phenomena, in different languages ("complementary languages"), e.g. from the standpoint and in the language of the observer, and from the standpoint and in the language of the actor, may be equally appropriate and equally true. An excellent application of this to the problem of the physiological mechanism of the brain and the Christian belief in personal freedom may be found in the chapter "Persons and Things" by Donald Mackay in *Science and Faith Today*, edited by John Baillie (Lutterworth Press, 1953).

itself, and many such books have in fact been written.¹ All that we can attempt to do here is to examine a few of the outstanding conceptions of modern psychology for the purpose of comparing their implications with those already examined in the last two sections.

The science of psychology is not so new a science as some people imagine. In fact, it may be said in some respects to go back to some of the ancient Greek philosophers, and a reading of the works of William James or even Freud, Jung and Adler will indicate that all these writers are aware of, and even influenced by, the ideas of the ancient Greek philosophers. Again, those who will take the trouble to refer to Book X of the Confessions of Saint Augustine will discover there comments upon the nature of dreams and the unconscious mind which in some ways forestall some of the ideas by Freud by 1500 years. Again, the biologists of the Victorian era were by no means unaware of the existence of instincts, not only in animals, but also in human beings; and the earlier development of psychology on its biological side was concerned largely with the study of instincts, a study to which more recently workers like William McDougall have contributed much.

There are many ways of approaching the study of psychology. It may be approached from the evolutionary and biological standpoint through a study of the development and nature of instincts and of behaviour from the lower to the higher animals and thence to man. On the other hand, it may be approached from a physiological point of view, and this approach, as we saw in the last chapter, has led, in the case of the behaviourist school of psychology, to a very mechanistic conception of the nature of human behaviour. Or psychology may be approached from the point of view of experimental laboratory methods, which leads to a somewhat academic type of psychology which has been applied particularly in the sphere of education, e.g. in the form of intelligence tests. But

¹ E.g., L. W. Grensted, *The Psychology of Religion* and *Psychology and God*; William Brown, *Personality and Religion* and *Mind, Medicine and Metaphysics*; R. H. Thouless, *An Introduction to the Psychology of Religion*; Victor White, O.P., *God and the Unconscious*.

it would probably be agreed that the really revolutionary contribution of the 20th century to the study of psychology has been the work of Freud and his followers and the development of psycho-analysis. (In what follows we shall use the expression "psycho-analysis", not as Freud somewhat arbitrarily demanded, solely in reference to his own teaching, but to include also the ideas of Jung and Adler.)

Before passing on further to discuss psycho-analysis, it may be well to point out that the biological approach indicates the existence in the human mind of various types of instincts or impulses. Numerous classifications of instincts have been attempted—those of McDougall, for example, become quite intricate—but, in fact, instincts may conveniently be divided into three groups: (i) the ego instinct or instincts of self-preservation; (ii) the sex instinct, or instincts connected with the production and rearing of families; and (iii) the herd instinct. It must be obvious that these three groups of instincts are mutually conflicting, i.e. that there is bound to be a dialectical tension between them. Such instincts as those which impel animals to seek food and drink, to fight for their self-preservation and to ensure their own health and well-being, tending to make them self-centred and aggressive, must inevitably come into conflict with those other instincts which exist in the case of a herd animal and which are directed towards the preservation of the herd. Again, the instincts which make a mother sacrifice herself for her young and feed them while starving herself, and which cause the male willingly to risk his life in order to protect the family and the nest, are clearly difficult to reconcile with either the instincts of self-preservation or the herd instincts. These facts are based upon little more than common sense, and the simplest observation of nature; but a good deal of the more academic psychology seems to consist rather largely in giving long and technical names to common-sense facts, which were known long before the days of modern psychology.

In the case of a human being it is clear that a personality which is the scene of unresolved conflicts between various groups of instincts will always be in an unstable and unhealthy condition. What is required is the gathering up and

integrating of all these groups of instincts in such a way that each makes its proper contribution to the life of the personality, obtains its proper fulfilment, and is yet controlled and directed aright. Charles Baudouin, a French psychologist who specialized in suggestion treatment, published in 1924, in combination with Lestchinsky, a book entitled *The Inner Discipline*,¹ and in this book he examined the fundamental moral tenets of Buddhism, Stoicism and Christianity, and demonstrated that of these Christianity, with its doctrine of *agape*, possesses the soundest conception of personality and behaviour, capable of integrating all the three groups of instincts. Christianity directs the aggressive tendencies of the ego instincts into channels where they may be used in opposition to evil, for these instincts undoubtedly produce energy and combativeness and some outlet must be found for them. Again, our Lord Himself did not say that we were to hate ourselves; rather He said, "Thou shalt love thy neighbour *as thyself*". Thus, a useful outlet for the instincts of self-preservation may be found in proper care and attention to the well-being of our bodies, which is essential for the proper carrying out of our work and duties; and it is also an obligation on Christians to do their best to preserve their bodies in a healthy and beautiful condition, since those bodies are the work of God and, as St. Paul tells us, "the temples of the Holy Ghost". So the Christian ethic finds a definite place for the instincts of self-preservation; but the energy of these instincts must be directed into such channels as those indicated above, and away from the more primitive channels of selfishness and selfish aggressiveness.

Again, the herd instinct is quite clearly a source of emotional or dynamic energy, which issues in the Christian activity of love of one's neighbour, brotherliness and all those other activities which are associated with true Christian fellowship. But here again the herd instinct, uncontrolled and undirected, will produce mob violence, hysteria, and those queer mental aberrations which have frequently been observed in mass behaviour. It is well known that individuals in an excited crowd cease to behave as they would normally

¹ Baudouin and Lestchinsky, *The Inner Discipline* (G. Allen & Unwin, 1924).

do, and become completely controlled by "crowd impulse". Vivid descriptions of the strange effect of mob hysteria are to be found in some of the books recording the conduct of French refugees during the German invasion of France in 1940. The examples of Nazi Germany, Fascist Italy and Stalinist Russia clearly indicate how it is possible wrongly to direct the herd instinct so that the individual ceases to act as a being with his own moral responsibility and becomes an automaton at the mercy of a ruthless State.¹

Finally, the sex instinct, rightly directed, can produce not only the unselfishness and happiness characteristic of a healthy and satisfactory family life, but also all those aesthetic activities which produce the finest forms of art. The instinctive root of the great writings of the mystics, of the loftiest love poetry, of the finest paintings and sculpture, is clearly to be seen in the sexual impulse. One of the greatest blasphemies of which man is capable is to adopt the attitude that sex and the sexual instinct are evil. In point of fact, there is perhaps no single work of God the Creator which has produced more beauty and done more to enrich life, as well as ensuring its continuity, than the sex instinct. The Christian ethic seeks to direct this instinct first into the production of families and children and the creation of conjugal, parental and family love, care and affection; and secondly into activities whose purpose is the glory of God, in the arts, in mysticism and in contemplation. Yet here again, if once these instincts are allowed to become uncontrolled and debased, the result is complete degradation of the individual concerned and on a wider scale the ultimate destruction of whole civilizations.

From all this it is clear that the Christian ethic and Christian moral theology provide the means whereby all these groups of instincts may find their proper and highest outlet, so that they contribute both to the production of an integrated and healthy personality and also to the happiness and enrichment of life. Instincts or impulses may be said to provide emotional energy or force. Each group of instincts tends to direct this energy or force to the satisfaction of a

¹ For an interesting if rather old, account of this instinct, see W. Trotter, *Instincts of the Herd in Peace and War*, Fisher Unwin, 2nd edition, 1919.

particular biological or physiological need ; but the emotional energy can be directed into various channels, and the secret of mental and spiritual health, as well as of a sound and scientific moral and ethical system, is that the various groups of instincts should be reconciled or integrated, and that the total emotional energy or "libido" should be given proper and useful means of expression.

It will thus be observed that the study of psychology indicates that there is in the human personality a dialectical tension which must be resolved in a true and healthy synthesis. The three groups of instincts mentioned above are all in tension one against the other, and we have here a complex dialectical situation. What is needed is a constructive synthesis of all three ; and this is provided by the Christian ethic.

Freud, however, has indicated another tension. In several of his works (e.g. *Beyond the Pleasure Principle*) he has referred to a tension between the will to live and the will to die. He points out that rather surprisingly there are clear indications of a desire that is present in the unconscious mind to seek rest and sleep, and escape from effort and anxiety in a return to the life within the womb or, as a second best, to the grave. We have here a conflict between the "life-instinct" which we have distinguished as characteristic of self-preservation, and another instinct, the "death instinct", the existence of which had not been previously recognized. Here again some synthesis is required, and it may be urged that it can be found only in a doctrine which, like the Christian doctrine, summons us both to a life of conflict, effort and activity here and now and also holds out the certainty not of rest merely but of peace, security and happiness in the ultimate existence after death.

Again, Freud and other psychologists have pointed out that there is in the infant mind both an impulse of love and an impulse of hatred ; and much modern child psychology is based upon the recognition of the need to find an outlet for the impulses of hatred, anger and destructiveness, as well as those of love, unselfishness and affection. In this connection it may be suggested that a good deal of harm has been done

to the understanding of the true principles of Christianity by the sentimental Victorian picture of the "Gentle Jesus". If we remember His attitude towards the Scribes and Pharisees or towards the traders who were desecrating the Temple, or towards Herod to whom he referred as "that fox", we shall recognize that He was by no means lacking in evidence of a rightly directed instinct of hatred. It is a vital part of Christian teaching that we should be capable of hatred and anger, rightly directed against those things that are evil. A sentimental ethic of benevolence, though it may give an outlet for the love instinct, can never provide any expression for the instinct of hatred, and will therefore lead to a repression of this instinct and a distorted and disintegrated personality.

It is impossible here to summarize the fundamental principles of Freudianism;¹ but it can probably be safely assumed that all readers will be aware of the fundamental basis of psycho-analysis. Whereas biological psychology, physiological psychology and what we may perhaps call "academic psychology" developed from a study of animal behaviour or of the behaviour and reactions of normal human beings, psycho-analysis originated in the clinical investigation of cases of neuroses and psychoses. Even in his earliest writings Freud was concerned with the causes of neurotic illness. He held that emotion was quantitative and could become displaced, and that a neurosis was caused when the emotion which was developed was prevented from escaping normally. Emotions thus suppressed had none the less to find some way of escaping and did this by undergoing a series of abnormal changes. They became lost from consciousness but were still potently capable of influencing the feelings and behaviour of the patient without his recognizing it. They were hindered from becoming conscious, and forced to remain in the unconscious, by some sort of force. The result was a split or divided personality. In every case a neurosis was to be regarded as due to a psychological conflict of which the

¹ For a clear summary of the relevant parts of Freudian psychology and a discussion of their implications for Christianity, see R. S. Lee, *Freud and Christianity* (James Clarke, 1948), to which the following paragraphs owe much.

patient himself was not conscious, since it took place in the unconscious mind. As has already been pointed out, it is a ridiculous idea to suppose that Freud discovered the unconscious mind. What he did do was to study it, to emphasize that its importance and its bearing on human behaviour had never been properly recognized, and to show that in the unconscious mind lies the key not only to much mental sickness but even to much of the behaviour of ordinary normal people.

In so far as psycho-analysis consists of a clinical method of treatment by means of conversation between the doctor and the patient with a view to the uncovering of the suppressed mental conflict and the resolution of it in the conscious sphere, it may be said to be the concern purely of medical science, except in so far as the doctor, in the process of curing this conflict, may himself make suggestions or offer advice to the patient. In some cases at any rate the suggestions or advice offered imply standards quite contrary to the Christian ethic. In these cases it may be objected that in fact the doctor is giving advice which is not wise; for, although his advice may seem justified from the point of view of the particular symptom he is treating, yet no conduct can in the long run be satisfactory which does not comply with that overall integration of the whole personality and of the impulses within it of which we have spoken above, and which can only be achieved by means of such a fundamental principle as Christian *agape*.

On the other hand, no Christian priest is likely to deny the value of self-examination or the necessity of bringing up into the conscious mind those things which are causing mental conflict or an uneasy conscience. C. G. Jung has openly stated that many of his patients were in need of spiritual advice and confession as well as of psychological treatment.¹ It is urgently to be desired that Christians should study psycho-analysis at least to the extent of making themselves acquainted with the fundamental principles of it, though nothing could be more deplorable than that priests,

¹ C.f. Chapter XI, "Psychotherapists or the Clergy" in C. G. Jung, *Modern Man in Search of a Soul* (Kegan Paul, 1933).

who have no training or practical experience, should attempt an amateur psycho-analysis of their penitents. Psycho-analysis is no substitute for sacramental confession, nor is confession synonymous with psycho-analysis. What is needed, as Jung insists, is much closer collaboration and mutual confidence between practising psychologists and psycho-analysts and Christians, particularly Christian priests. If a priest receives a confession or confidence which leads him to recognize that the person concerned is in an abnormal and unhealthy mental or neurotic condition, he should do his utmost to ensure that that person consults a psychologist. On the other hand, if a psycho-analyst discovers that the cause of a patient's symptoms lies partly or largely in the spiritual domain or the realm of conscience, he should not attempt to discredit the whole moral sense or conscience as something undesirable or unhealthy, but should rather enlist the help of a wise and experienced Christian priest in giving spiritual relief through the ministry of confession and absolution.

Psycho-analysis in the hands of Freud was by no means confined to its use as a practical or clinical method of treatment. From the data which he obtained through the study of his patients Freud attempted to build up, first, a complete explanation of the nature of human personality, and secondly, what can only properly be described as a philosophical system. He wrote largely on such subjects as religion, ethics and philosophy as well as anthropology and comparative religion. It was when he carried the ideas derived from medical practice into such spheres that he laid himself open to the greatest criticism. In this incursion into wider fields Freud was followed both by Adler and by Jung, as well as by other psychologists; but it may be said that on the whole Jung displays a far better and more balanced understanding of philosophy and religion than Freud ever did; and, unlike Freud and Adler, Jung is a Christian.

Because he was so largely concerned in his practice with the investigation of those things which lay in the unconscious mind Freud, perhaps naturally, tended to believe that they dominated the whole field of human conduct. He was in fact led to regard consciousness as being merely an "epiphenom-

enon". Again, he considered that when men supposed that they had reached a conclusion by means of reason or logic, what they were really doing was seeking some conscious justification for a belief which in fact they held for unsuspected and hidden reasons which could only be discovered by the investigation of their unconscious minds. In other words, they "rationalized" the wishes which arose from their unconscious minds. From this it followed that it is impossible to trust the power of human reason. This conclusion produced some very strange effects on Freud's later writings. There can rarely have been a more bitter attack by a scientific man on those colleagues who differed from him than that made by Freud, for example, in his "New Introductory Lectures on Psycho-analysis". Both here, and even in his earlier books, Freud does not so much argue logically, as simply state theories and conclusions dogmatically and ask that they be accepted. If acceptance is withheld, he then maintains that the reason why doubters are unwilling to accept his conclusions is that they have some psychological, unconscious inhibition which prevents them from doing so. He never admits that any of his own theories may be unsound. The result of this is, of course, to render scientific discussion impossible and stultify the whole method of scientific research. It is probably on this account that the conclusions of psycho-analysis have for so long been suspect by scientists and doctors in other branches of science and medicine.

Again, if human behaviour is entirely dominated by factors in the unconscious mind which are unknown to and uncontrollable by the person concerned, the whole conception of free will and moral responsibility is at once undermined, if not destroyed. On this side, therefore, the ideas of Freudian psycho-analysis constitute a very serious threat not only to Christianity and Christian belief but also to all forms of morals or ethics and every sort of philosophy and science. Freud pointed out quite rightly that, for example, human beings frequently develop diseases such as paralysis through an unconscious desire to avoid undertaking some duty. In this case a man's selfishness or shirking of duty cannot be held

against him as a moral fault, since he is himself quite unaware that he is shirking it; yet on the other hand it cannot be denied that such selfishness and indolence are in themselves evils. Here the cure for a moral evil lies not in conscious repentance but in psycho-analysis. But if such explanations of moral shortcomings are extended not only to cases of definite neuroses or psychoses or physical symptoms derived from them, but to the *whole* field of human conduct, then there is a denial of all moral responsibility. Man becomes the slave of his own unconscious; reason and free will are illusions; and human nature is as anti-rational and mechanistic as in the behaviourist conception.

Again, Freud attempted to give psychological explanations for belief in God, for the conception of conscience and righteousness, and for the recognition of sin and the need for repentance, in terms of tendencies which develop in the human mind in infancy. He put forward a very detailed theory of the sequence of mental development during the first years of infancy and childhood. The first stage—the bridge by which the young child's mind passes over into an awareness of himself and of the outside world—is dominated by the mother, and the developing mind may be held up at this point, in which case there develops an abnormality which is described as a "mother-fixation". To the infant the mother stands for a sense of security and self-importance, but he soon progresses beyond this to the next stage of development in which the father becomes a most important influence in mental evolution. Gradually, the child distinguishes the father as a separate person from the mother. On the one hand the father may stand for a loving, protecting, gift-bringing person, or on the other hand he may stand for one who imposes his will by violence and awaits opportunities for attack. He tends to overawe and fascinate the infant, who regards him as strong and all-powerful, masterful and the source of authority. This authority is frequently seen as the prohibition of desired satisfactions. But it is an essential part of Freud's doctrine that the real mother and real father give rise in the infant's mind to a "mother-image" and "father-image" which retain characteristics associated with the

mother and father respectively, but are certainly not a replica of the actual mother and father. They are rather an idealized and even generic or primal form of the idea of mother and father which are formed in the infant mind. These ideas usually persist to some extent in the mind throughout the whole life. Moreover, Freud argues that as the infantile sex instincts develop there is in the case of the boy an intense desire to possess the mother and oust the father. The realization of this wish produces a feeling of guilt in the male child and also a feeling of fear of the father. Ultimately, the child identifies himself with the father, and this produces a division within his Ego. Father identification becomes the Super-ego, the source of inner commands, censorship and standards—the Ego-ideal. This Super-ego is the source of the sense of duty and is the seat of conscience. On the other hand, the child feels the need of security and protection in face of the dangers and trials of real life. When the actual father is no longer able to give this, the child seeks it in the “father-image” which must be given some form of reality in the mind and is therefore identified with God; for God is not an idea which emerges unprompted in the infant’s mind, but an idea which is inevitably presented to him by his parents and teachers; and those ideas which were associated with the father-image—such as fear or awe, strength, authority and discipline—become also associated with God, upon whom the father-image is projected. This, in very brief outline, is how Freud explained the existence of the idea of God in the human mind, and it will be seen that in his explanation there is no suggestion that this idea has or needs to have any objective reality in fact. He would not admit the possibility that the conception of God can be derived from a rational study of the universe and from the normal experiences of humanity, and tested by investigation and experience in the same way that a scientific theory is tested. He seemed to be unwilling to admit this possibility, because he had already reached the conclusion that no idea is in fact the product of human reason or scientific study, since what we suppose to be derived from human reason (and therefore scientific study!) is really the product of our own

unconscious mind. Consequently, his supposed criticisms of religious belief are not in fact criticisms of religious belief at all, but only of what he wrongly supposed to be religious belief. Moreover, all his theories as to the origin of religion, the idea of God and conscience, depend upon his account of the development of the mind during infancy. Unless this account is accurate at each detailed stage, the whole of his explanation of religion falls to the ground; but it can hardly be denied that his views as to the precise stages by which the infant's mind evolves and the precise reactions of the infant at each stage are highly speculative, and they have in fact been rejected, at least in part, by many other psychologists.

On the other hand, it is perfectly true that the majority of Christian people hold, intermixed with sound, reasonable Christian doctrine and spiritual experience, false ideas concerning God and their religion which are no part of true Christianity, but are in fact in some form or another either wish-fulfillments or the result of fixations or repressions, consequent upon arrested mental development or maladjustment in infancy. In so far as he helped to remove these accretions and distortions from the true Christian faith, Freud rendered a real service to Christianity; but in so far as he supposed that there are in Christian doctrine no ideas other than those based on purely subjective unconscious desires, he was completely wrong. It would be interesting to know to what extent he would have considered that the ideas of scientists in other fields concerning their own science are derived purely from unconscious irrational sources, and how far, if at all, they are derived from reason and investigation! To be consistent he would have had to maintain that every part of scientific theory is the result of unconscious and unrecognized factors in the minds of scientists. Though the data obtained from experience, from which scientists (and psychologists!) start, may be truly objective, yet the construction and interpretation which they put upon those data must on Freudian principles be derived from, or at any rate largely influenced by, unconscious factors in their minds. But Freud seems never to have bothered to turn his attention to this field. Both he and other psycho-analysts treat Religion simply as a necessary

illusion—useful in its way at present, as meeting certain psychological needs of the unconscious mind, but having no relation to truth or objective reality. One of Freud's principal works on religion is entitled, *The Future of an Illusion*.

What does seem strange and very unfortunate is that a number of scientists, particularly biologists, have accepted Freud's views on religious matters absolutely uncritically and as if he were blest with complete infallibility. C. H. Waddington, for example, in his work, *The Scientific Attitude*, accepts Freud's theories on religion unquestioningly and bases much subsequent argument upon them. A full discussion of this whole matter would, as has already been said, have to extend to the length of a complete book and cannot therefore possibly be undertaken now. It is hoped, however, that what has been said may indicate some points in which psychoanalysis is of value to Christianity and other points on which undoubted conflict exists between them. We may say that Freud has rendered a great service not only by the medical value of his methods in the clinical treatment of neuroses and psychoses, but also in his study of sex and its importance and proper function. In so far as he has helped to disperse the disastrous reticence and prudishness which in some previous generations surrounded this whole matter we may be intensely grateful to him. Moreover, in his study of the sex instincts he has done much to emphasize the value and potential beauty of love, and has also indicated how the sex instincts may be sublimated into constructive and artistic channels. To examine in detail Freud's conception of the human personality, consisting as it does of the three factors of the Super-ego, the Ego and the Id, would require much more space than is available to us. It has already been suggested that it is open to considerable criticism in its explanation of conscience and the moral sense and in its exaggeration of the complete dominance of the unconscious. On the other hand, there are undoubtedly elements of truth in it; and the reasonable recognition of the importance of the unconscious, and of the influence of unconscious forces and impulses, of suppressed conflicts and infantile experience, upon human personality and behaviour, is a valuable contribution to the

explanation and understanding of human nature; which should be taken into account by every student of religion or morals. The greatest danger of Freud's ideas is that they tend to destroy belief in free will and reduce human beings to the level of automata controlled not, as is suggested by certain physiologists, by the mechanistic, physical or physico-chemical reactions of the human nervous system and brain, but by the unconscious mind. It will be realized at once that the account of the human mind given by Freud is almost wholly incompatible with the account of it given by these physiologists. If the behaviourist, for example, admits of the existence of an unconscious mind at all, his account of it will be completely different from that given by Freud. But in their ultimate results both are very similar, since they both destroy human free will, moral responsibility and human reason. It is perhaps, therefore, some consolation to recognize that they are so much in conflict with one another, and that it is quite clear in view of the studies of Freud that an explanation of human behaviour as being entirely controlled by the physics of the brain is quite inconceivable. On the other hand, an account of human behaviour which attributes everything to unconscious mind leaves no place for those obvious phenomena which are due either to physical or biochemical factors.

There are many other aspects of Freud's psychology and its bearing upon religion which merit discussion, but fortunately many of these have been dealt with by R. S. Lee in his *Freud and Christianity*. While there is a tendency in his book to regard psycho-analysis as the standard by which all else is to be judged, which leads Lee too readily to criticize or abandon various elements in the orthodox Christian faith, his account of the fundamental ideas of psychology is admirable, and his discussion of their bearing on religion, though not necessarily sound in every detail, at least indicates the essential questions which are raised for Christians by psycho-analytical ideas.

Before passing, however, from the psychology of Freud to other psychologists, it is desirable to emphasize the value of Freud's distinction between displacement and sublimation.

When an instinct comes into play and produces an impulse towards a certain type of action, it may frequently be the case that the simple, primitive or normal satisfaction of this instinct is prevented by circumstances. Sometimes these circumstances may be purely material, e.g. economic; on other occasions they may be of a more social character, that is to say, that the primitive satisfaction of the instinct involved would be prejudicial to the well-being of the community. In such cases the code of conduct prevalent in that community will rule out this course of action as morally wrong. In such a case there will be a strong ethical bar in the individual's Super-ego, and this will impose an unconscious repression of the primary outlet of the instinct. But every instinct may be regarded as producing a certain quantity of mental or emotional energy, and this energy must find some escape, unless it is to be completely bottled up. In the latter case the amount of energy in the conscious mind which will be required to neutralize or imprison the instinctive energy may be so great as to produce a condition of mental exhaustion and illness. On the other hand, if this is not to occur some outlet must be found for the instinctive energy involved. Such an outlet may be found by diverting the energy into some other channel of activity. If this other channel of activity is conscious and consciously accepted, a healthy outlet has been found for the energy; but if the outlet is not consciously accepted an opposition or neurosis may result. Such a repressed instinct may find its outlet in some unconscious idiosyncrasy of behaviour or some peculiarity of which the individual is perfectly conscious, but which he finds it almost impossible to control—for example, Dr. Samuel Johnson's habit of hitting lamp-posts with his walking stick, or Freud's own habit of spitting from the tops of buildings on the bald heads of people passing below. In this case, because the reaction is not consciously accepted by the person concerned, it cannot be regarded as a satisfactory form of utilization of the instinct. On the other hand, if the instinct is used in some constructive and happily accepted form, true sublimation may be said to have occurred. "A life of self-sacrifice, for example, may be the expression of a free and highly developed personality; on

the other hand, it may be the outcome of a strongly repressed masochism—a tendency or impulse to seek suffering because of the unconscious pleasure which is derived from it, and which is neurotic when strongly developed.”¹ This has a very definite bearing on religion, since there is always a danger that the more extreme forms of asceticism may in fact be displacements of this neurotic type rather than true sublimations. No displacement can be truly healthy. Any such phenomenon will result in a somewhat neurotic and unbalanced condition of personality, and true Christianity can never be satisfied with displacement, but only with sublimation; though, as Lee points out, we must not imagine that the definition of a sublimation is that it is a course of action which is necessarily good. It is a course of action which is psychologically healthy. At the same time, since Christianity aims at ensuring complete health of the whole personality, it will follow that sublimations rather than displacements will comply with Christian ideals; though a course of conduct produced by a displacement may be morally just as right in itself as that produced by a sublimation.

To describe the details of the philosophical system of C. G. Jung would be far too long a task to attempt here, nor can we indicate the points in which he diverges from and contradicts the doctrine of Freud; but it may be suggested that in many ways the general philosophical standpoint of Jung in his later works is far easier to harmonize with Christian doctrine than that of Freud.² Freud undoubtedly tended to over-emphasize the importance of the “pleasure principle”. He suggested that the desires of the Id were entirely dominated by the pleasure principle, though he indicated that the ultimate satisfaction of pleasure was death.

Jung, on the other hand, recognizes far more clearly the truth and value of Christian moral principles. In his conception of the libido he differs from that of Freud in using the term (as we have used it above) to include all unconscious

¹ R. S. Lee, *op. cit.* p. 55.

² On this see Victor White, O.P., *God and the Unconscious* (Harvill Press, 1952).

emotional energy and not merely the energy of sex instincts, and here he has provided an invaluable term for psychological energy. But probably the most interesting part of Jung's psychology from a religious point of view is his study of the collective unconscious. He has distinguished in dreams and other unconscious processes of the human mind the emergence of a lower level of the unconscious, which is derived not from individual experience or development, but from the philogenetic racial experience of the species. Thus there emerge certain archetypes which are common to the whole of humanity and are found in almost every religion, if not in all. He says that in addition to that part of our unconscious mind which is formed from the development of the experiences of our own early infancy, and on which Freud lays so much stress, there is a further element in the unconscious which is derived not from the experiences of the individual but from those of the whole race and is therefore common to all human beings, at least of that particular race. These archetypes include such things as water, the animal or feminine aspect, the mother and father symbols, the horse symbol, the old wise man, and the hero. Many of them, as Freud points out, arise in the first instance from sexual associations; but they gather to themselves, as Jung saw, a much wider significance. When we see how many of Jung's archetypal symbols occur in Christian doctrine, we recognize how much this doctrine has taken account of the archetypal collective unconscious of mankind, and has utilized and explained these symbols, making them the vehicles of profound spiritual truth. Or, to put it in a more Christian way, God has used this element in the human mind, to develop certain pregnant fundamental symbols and dawning mental conceptions, the full understanding of which comes only with knowledge of the Christian Faith.¹

The other great contribution of Jung to psychology is, probably, his distinction between the introvert and the extrovert type, and his study in very intricate detail of eight sub-types, themselves divisible into many variations; and an

¹ On the use of symbols, see Austin Farrer, *The Glass of Vision* (Dacre Press, 1948).

understanding of the psychology of these various types would seem to be very useful for any priest or spiritual director.

Adler's great contribution to psychology is the study of the inferiority complex. It is unnecessary to summarize his psychology; but we may note that in the emphasis which he gives to the enormous disturbance of mental health and personality which may be occasioned by the sense of inferiority and the neuroses which may result from this repression, Adler is merely vindicating the teaching of the Christian moralists, that pride is the root of all sin. The instincts of self-assertion, repressed instead of being sublimated or directed into constructive channels, inevitably result in a warped and distorted personality, and we may well think that Adler is right in suggesting that a great many of the evils of humanity are occasioned by this. It is only when the sense of one's own importance, or of injustices which one considers oneself to have suffered through a neglect of that importance, is lost in happy, willing and unselfish love and service that a healthy or integrated personality can be achieved. It would seem that in this sense Adler's psychology is extremely compatible with the Christian faith. On the other hand, there is in his psychology a sense of aggressiveness and self-assertion which can be very dangerous if it is not directed into more constructive channels, and the influences of certain Adlerian theories on the education of children would seem to be somewhat undesirable in so far as they advocate allowing childish instincts of self-assertion unrestricted satisfaction, thereby not only undermining the conception of reasonable discipline, but also rendering the children unable to face up to the sterner realities of adult life.

There are two further subjects to which we must refer before concluding this very brief discussion of one or two aspects of psychology. One is the use of hypnosis and suggestion. To some extent it may be said that most psychologists make use of suggestion, though some employ it to a much greater degree than others. When it is utilized in the service of medicine and properly employed, suggestion can be most valuable; but it is clear that the power of one individual through suggestion to influence the mind of another is open

to serious possibilities of criminal misuse; and when this is added to a shrewd and ruthless use of psychological knowledge it may become extremely dangerous, as was obvious from the effects of Nazi methods of instruction and propaganda.

Finally, there is the more extreme form of hypnosis.¹ Here again the power of one human being to influence another may be used in medicine with beneficial results, though hypnosis is only rarely used in psychological treatment; but very grave dangers can arise from the misuse of this power, and it is essential that those who possess the knowledge of the hypnotic method should use it only in the strictest accord with Christian moral principles. A form of suggestion which received great prominence some years ago was that of auto-suggestion, in which the patient was urged to lead himself to believe certain things by persistently suggesting them to himself. Here again this method in psychology has proved to be of very limited application, for it cannot touch any serious form of mental or nervous illness. But the subject of suggestion and auto-suggestion has a distinct relationship to that of spiritual healing or faith healing. It is quite clear that by suggestion or hypnosis many persons can in fact be given such confidence that they do recover not only from psychological but even from physical illness. On the other hand, the experience of those who have employed this form of treatment is that in many cases there is little or no good result at all. If faith healing is dependent solely upon the *emotional conviction* of the person concerned that he is to receive healing, disappointment will very frequently follow. Nor is this failure necessarily a sign of any lack of genuine faith. But the Christian conception of spiritual healing is a much wider and deeper thing than this. When a Christian thinks of healing, he thinks of it in terms of the whole human being; and it may often happen that the spiritual power given through prayer, through laying-on of hands or through unction, may have far greater effect in the spiritual realm than in the physical. For example, a sufferer who is faced with a serious operation,

¹ For a summary of the use and value of hypnotism, see the report of a sub-committee of the B.M.A. published in the *British Medical Journal* for April 22, 1955.

and who receives such spiritual ministration, may not benefit from the point of view of the operation itself; but experience shows that he will often have infinitely more courage, peace of mind and lack of apprehension than one who has not had this benefit. Again, a person suffering from some disease regarded as incurable, who receives spiritual aid, may not to any appreciable degree be cured of his ailment as a result of this; but it may well be that he receives a new courage, patience and faith which enable him to bear his suffering in a completely different manner.

Again, psychology shows that there are many cases in which physical illness is in fact due to unconscious mental conflicts, or even to conflicts which are conscious. In such cases, if the conflict can be resolved, the physical symptoms will disappear. If such a conflict is of a moral or spiritual nature, i.e. if the sufferer is aware either in his conscience or in his pre-conscious mind of an unconfessed sin which causes him continual mental anguish, then, if this sin can be exposed and confessed and absolution received for it, the consequent peace of mind may effect physical healing. It is surely for this reason that in many of the healing miracles Christ first insisted upon pronouncing the forgiveness of sins. All this goes to emphasize what has already been pointed out in earlier sections, namely, the close and intricate connection between body and mind, between matter and spirit, and the inadequacy of the Cartesian dualism in this respect.

It was pointed out in a previous section that the traditional Christian doctrine concerning disease is that it is due, at any rate to some extent, to the evil activities of malign, self-conscious, rational, rebellious spirits in opposition to God, and that it is therefore impossible to make any hard and fast separation between moral, mental and physical ill health. Where there is sin, where a person is under the power of evil spiritual forces, there it is impossible for him to be in a completely healthy *physical* condition. It is not to be suggested for one moment that illness is always the result of sin or that its presence indicates either the judgement of God upon the person concerned or a lack of faith on the part of that person.

On the contrary, many of the greatest saints and those most trusted by God have been called upon to bear the greatest physical illness, pain and suffering, and through their patience and courage have won others to believe in the power of Christ. But our Lord clearly taught that many forms of disease were contrary to God's will; and He extended this belief to cases of what we should now call insanity. It may be objected that the terms in which He expressed Himself were those which were common and intelligible to the people of His time and that it was solely for this reason that He spoke of insane people being possessed of the devil. Psycho-analysis has shown that in a large number of such cases the power of compulsion experienced by the person concerned, formerly thought to arise from possession by the devil, is really the force of the repressed complex which causes the mental disturbance. From a purely psychological angle this no doubt is a satisfactory analysis, and the only possible conclusion; and yet those who have had an opportunity of studying at first hand the incredible changes that take place in the personality of one who is afflicted with such an illness as some forms of melancholia, schizophrenia or acute depression will find it difficult to believe that nothing more is involved than a repressed complex. The person concerned is so clearly aware of some *active* force compelling him to behave in a way contrary to his whole character, and his real character can so clearly be distinguished behind this compulsion, emerging at occasional intervals. It is difficult to assess this evidence in any scientific way, and yet it is a real matter of experience in such cases. The patients concerned would certainly agree that they are under the compulsion of evil forces or, to put it pictorially, possessed by the devil. In such cases there may be room in suitable circumstances for the employment of spiritual methods analogous to those of spiritual healing but more combative. Our Lord left command to His disciples to exorcise such cases of possession; and it may be suggested that if the account of the origin of evil put forward in the earlier sections of this book is correct, the practice of exorcism should still in certain cases be employed, and the spiritual forces of goodness and

love used to disperse the dark hordes of evil. This is no doubt a conclusion which will not be acceptable to the vast majority of scientists. It is not surprising that psychiatrists should distrust any re-introduction of spiritual or demoniacal conceptions in connection with insanity, when it is remembered what appalling barbarities and cruelties were practised against lunatics until comparatively recent times, largely because they were regarded as "agents of the devil". But indeed a true understanding of the doctrine suggested above would arouse only pity and sympathy towards such sufferers, and an intense desire to deliver them from their anguish, whether by spiritual or medical methods.

Perhaps the point on which Freud's researches compel us most seriously to reconsider certain ideas widely current in Christianity is their bearing on the nature of conscience. The strict definition of conscience in moral theology is as follows: "Conscience signifies a dictate of the practical reason deciding that a particular action is right or wrong." This definition clearly indicates that conscience is an intellectual faculty, and that its exercise consists in reaching a moral decision by rational and logical thought, that is, by the application of intellectual principles to the empirical data of a practical problem. This definition is very different from the sentimental meaning given to the term by some Christian writers and by the vast majority of ordinary people! In common speech the word "conscience" is often used to describe an *emotional* conviction or an intuitive sense that certain things are right and others are wrong. Even reputable theologians have spoken as if conscience *in this emotional sense* is a light of divine inspiration. The data gathered by Freud indicate that this emotional conception of conscience is totally unreliable and extremely dangerous. The feelings and emotional convictions which arise in a person who decides his conduct in this fashion are shown by psycho-analysis to arise from nothing else than certain elements in the unconscious. Freud's description of the processes leading to the formation of the super-ego in infancy makes clear the probable origin of these strong feelings or intuitions. Tremendous harm has been done in human history,

and in Christian thought and action, by reliance upon emotion rather than upon reason and will. It is essential that this should be recognized by Christians, and that in the formation of the theological conception of conscience the researches of Freud should be taken into account and precautions taken to guard against a wrong conception of what is meant by conscience.

4. PARA-PSYCHOLOGICAL FACTORS

We have now examined various factors which contribute to the working of the human mind, including physical, chemical and biochemical, physiological, hereditary and psychological factors. It is assumed by many scientists that there are no other factors present, at any rate in what is usually called the brain or in perception; but recent work on psychical phenomena has rendered this conclusion exceedingly doubtful. The publication of books like *New Frontiers of the Mind* by J. B. Rhine¹ and *Science and Psychological Phenomena* by G. M. M. Tyrrell² indicates how much evidence exists for a form of perception which is not accounted for by the ordinary five senses. This is called "extra-sensory perception". Tyrrell lists four separate forms of what he calls "spontaneous extra-sensory perception", namely, telepathy, clairvoyance, precognition and object-reading. All psychical evidence must always be subject to a good deal of suspicion, and it is difficult to eliminate every possibility of normal explanation, fraud or delusion. But it is clear from Tyrrell's book that he has made every possible effort to approach the evidence in a truly scientific spirit, using whatever scientific methods are appropriate; and he is able to show that the case for the real existence of "e.s.p." is very strong. It is probably now admitted by a large number of scientists that telepathy is a fact. The same applies to precognition; and here reference may be made to J. W. Dunne's *Experiment with Time*, in which he cites remarkable cases of

¹ J. B. Rhine, *New Frontiers of the Mind* (first published 1937; Pelican book, reprint, 1950).

² G. M. M. Tyrrell, *Science and Psychological Phenomena* (Methuen, 1938).

precognition. In fact, such cases of precognition have probably occurred within the experience of most of us. It is not easy to separate such precognition from the simplest forms of clairvoyance. Two famous examples of a type of retro-cognition are the vision of Margaret Jourdain and Miss Moberly in the Garden at Versailles,¹ and the curious experience of Edith Olivier of Avebury.² In the first case the two ladies concerned suddenly found themselves in the midst of the age of Louis XVI, and in the latter case Miss Olivier found herself in the midst of a fair at Avebury which had been discontinued centuries earlier. It is not a scientific attitude to such things to take up the position that they could not have happened. The scientist who refuses to accept a well-attested event, simply because it means an inconvenient reconsideration of his categories or conclusions, is a very bad scientist. Rhine and Tyrrell have both carried out laboratory experiments on telepathy and clairvoyance and on "e.s.p." generally, under conditions where strict control was possible. Such experiments are inevitably of a very simple character, but they do clearly indicate that it is impossible to maintain that we have finished our consideration of the working of the human mind or personality when we have dealt with ordinary sense-perception. It would be impossible here to summarize the evidence contained in such books as those mentioned, but it is significant that philosophers such as Professor C. D. Broad of Cambridge and Professor H. H. Price of Oxford are convinced of the validity and importance of this evidence. The religious significance of these conclusions is admittedly very limited;³ but it is evident that just as these facts cannot be denied, so it would be unscientific to deny the reality of the human self and personality, and of spiritual and mental activities of the human being which cannot be analysed and explained in terms of chemistry or physics—or even psychology.

¹ C. A. E. Moberly and E. F. Jourdain, *An Adventure* (Faber & Faber, 1931).

² Edith Olivier, *Without Knowing Mr. Walkley*—personal memories: pp. 227–30 (Faber & Faber, 1938).

³ For a discussion of this see H. H. Price, *Some Aspects of the Conflict between Science and Religion* (Cambridge University Press, 1953).

PART III

PROBLEMS ARISING OUT OF CERTAIN ASPECTS OF CHRISTIAN FAITH

CHAPTER I

MIRACLES

ONE of the points on which there has been most conflict between Christians and scientists is in connection with the miracles in the Bible, particularly the New Testament, and the idea of the miraculous in general. It is apparent from statements by many scientists that it is the Christian insistence upon the reality of certain miracles which proves the most serious stumbling block, in their case, to acceptance of the Christian Faith.

As we have already seen, the scientific method presupposes the rationality and orderliness and fundamental uniformity of the universe; that is to say, it presupposes that events do not happen fortuitously or arbitrarily. It is perhaps because miracles may at first sight appear to contravene this fundamental presupposition that scientists are so very reluctant to admit their possibility. The scientific method, as we have previously seen, is concerned with generalizations and general principles, with the uniform or normal. Scientific law has been defined as a statement of what may normally be expected to take place under certain specified circumstances. As we have observed earlier, scientific procedure extracts from *assemblages* of individuals precisely those elements which they share in common: the individual and those characteristics which distinguish it from other individuals is always a stumbling block for scientists, since the very method of science is deliberately devised to exclude them. This procedure of science is entirely justifiable as a means of studying the universe for the purpose of propounding general principles; but it is very important to recognize that by its very nature this method must be inapplicable to events which are unique, individual or abnormal. Professor Ian Ramsey has pointed out that there are

various orders of God's activity: there is His first order of activity, displayed in His providential care for the universe, which shows itself in the ordinary, regular, uniform processes of the natural world, so essential for the maintenance of life. But there is His second order of activity, which shows itself in events which, while integrated with those of the first order activity, are distinguished from it by being unusual or abnormal. Finally, there is His third order of activity which shows itself in a few unique events, and primarily in the supremely unique event of the Incarnation. The language and method of science are devised and intended for the study and description of events arising from God's first order activity, and it is not surprising that they should prove inadequate when applied to those of His second or third order activity.¹

The occurrence of miracles presented an insuperable obstacle to the scientists of the 19th, the 18th and the late 17th centuries, who believed that the exact mathematical physics of Newton gave a precise, adequate and complete description of all the phenomena of the natural world. In this system the term "law" as used in science meant a clear, certain and universally valid principle, unveiled by men but inherent in the universe. These natural laws were generally regarded (despite the philosophical objections of Hume and Kant) as being present in nature independent of any observer. As we have previously explained, modern science has completely abandoned this conception of the term "natural law", and in modern science the term natural or scientific law is used to indicate statements of probabilities, often expressed in mathematical formulae, which are arrived at by essentially statistical methods. It is now recognized that there is no one single set of scientific laws which will correlate and clarify all the phenomena of the natural world. Even in mathematical physics and astronomy the developments of

¹ This matter is well discussed by Douglas Spanner in his chapter on "Miracles" in *Science and Faith Today*, edited by John Baillie (Lutterworth Press, 1953). He points out that the New Testament writers, recording a miracle, are concerned with what it indicates about Christ, what it is a *sign* of, whereas a scientific writer would be concerned with its mechanism, i.e. how it was carried out.

relativity and quantum physics have shown that one variety of geometry is required for one type of event and another variety of geometry with different laws for another type of event. Moreover, modern physical theory has also shown that no "laws" can be regarded as inherent in nature, that all are dependent upon the observer, and that they are all in essence the products of the human mind. They are convenient generalizations made by scientists for the guidance and correlation of their observations and experience. The fact that scientists no longer hold the 19th-century view of the significance of natural laws does not, however, mean that they have abandoned all belief in the uniformity and orderliness of nature. As we have already explained in the first part of this book, if they had done so they would, in fact, have ceased to believe it possible to arrive at any form of general principle or generalization whatever. Only if the world is reasonably uniform and orderly can we apply to it even statistical and mathematical laws of the modern type. But the fact that we no longer believe the laws of science to be rigidly exact and unalterable does perhaps mean that it is not so difficult for a modern scientist to admit that there are individual events which appear to break these laws as it would have been for a 19th-century scientist to admit the same thing.

Thus the essential presupposition of science is not that the universe is governed by a set of cast iron, precise, exact and rigid laws, but that it is uniform and orderly rather than chaotic, inconsistent or arbitrary. Therefore, while the presuppositions and methods of science do not preclude rare exceptions to the established "laws" of science, much less the existence of events or factors not ascertainable by the methods of science or expressible in its language, they do rule out events which are entirely in conflict with the underlying purpose, design and order of the universe. There seems no reason why the modern scientist should not admit the possibility of occurrences which are outside, or in conflict with, known scientific "law", or are indeed beyond the scope of scientific investigation or scientific language, so long as these exceptions do not interfere with the whole working and rationality

of the universe.¹ If we believe, as has been suggested in the first part of this book, that the world of nature is the work of God in which His power and guidance are always active, and for which He has a master design and plan, then on scientific as well as on theological grounds we are bound to say that no event can happen which is not *ultimately in harmony* with this over-all divine plan. The order, consistency and intelligibility of nature is not the same thing as rigid uniformity or mechanistic determinism. On the other hand, the very word "miracle" is an admission that such exceptions to the "norm" or general rule are rare and remarkable, and that uniformity and regularity are usual and general. Miracles imply the use by God of unusual methods; but although the methods are unusual they are used to achieve results which are in harmony with His general purpose. If we believe that God is omnipotent, it must follow that He has power to use the material which He has created in any way which serves His purpose; but He is still bound by the laws of rationality and logic and the laws of morals.² That is to say, it is not possible for Him to act in such a way as would contradict the most fundamental laws of logic and reason. This, apart from being by definition impossible, would also contravene His character as a God of Truth. Again, He is bound by moral laws, inasmuch as by His very nature of goodness and righteousness He must by definition be incapable of any action which is morally wrong. Thus, the omnipotence of God does not mean that He is able to do anything whatever, however absurd or self-contradictory it may be or however bad or

¹ In fact, from time to time in scientific research the totally unexpected happens, and compels the scientist to recognize that his postulated laws in that particular field were inadequate. Such an "anomaly" cannot be *denied*; it compels the scientist to set about revising his *statements* of natural laws. But as Douglas Spanner points out (*op. cit.*) the scientist cannot call it a *miracle*, which is not a scientific category; he must record it as "an anomaly" or "an unusual event".

² "Plainly we cannot mean (by the word omnipotent) that God can do whatever we imagine, for we can imagine Him doing irrational and evil things. But in doing such things He would be contradicting His nature. God's action must be limited by His character as Rational and Love." (W. R. Matthews, *God in Christian Thought and Experience*, Nisbet, 1930). Cf. also St. Thomas Aquinas, *Summa Contra Gentiles*, I, 84, "God's will cannot be of things impossible in themselves."

immoral it may be. But if we admit the qualified omnipotence of God as it has here been defined, it is obviously quite unreasonable and unscientific to rule out from the start the possibility of miracles. A miracle from this point of view will be a unique or unusual event in which occurrences take place which are not covered by, or in agreement with, ordinary scientific laws, but which nevertheless are, and normally can be seen to be, in harmony both with the character and purpose of God. The fact that miracles are of this nature and that they are rare and unusual events will naturally produce in the scientist an attitude of surprise and even of suspicion, and it is right that this should be so. The scientist, confronted by any event which appears to contradict the laws of science, will require convincing and unprejudiced proof that the alleged event has in fact occurred. In other words, there are two questions to be considered in connection with miracles. The first is, "Is it possible for a miracle to occur?" and in what has been said above we have answered Yes to this question.¹ But there is a second question on which scientific or historical evidence can and must be produced, namely, "Have miracles ever occurred?" and, in regard to a particular alleged miracle, "Has this particular event occurred and is it really a miracle?" The evidence for each miraculous event must be carefully and impartially studied and its accuracy and reliability tested by the normal methods of scientific and historical enquiry. The accuracy of the witnesses or authors concerned must be judged without prejudice and the whole question must be approached in a spirit of objectivity and detachment, with an open mind. As has been said, the scientifically trained person will require to examine the evidence very closely; but it would be the very antithesis of the scientific attitude to have made up one's mind before even approaching the investigation of the occurrence, and to have ruled out the possibility of a miracle altogether.

We now turn to the particular miracles mentioned in the Bible, and especially those associated with the Christian

¹ For further discussion of this question, see C. S. Lewis, *Miracles* (Geoffrey Bles, 1947).

Faith. We may conveniently classify the miracles of the Bible under the following heads: (*a*) nature miracles; (*b*) ordinary events told as miracles by imaginative spectators or in poetic terms; (*c*) miracles difficult to credit yet not inherently impossible; (*d*) miracles of healing; and (*e*) vitally important miracles or unique events, such as the Resurrection of our Lord.

(*a*) NATURE MIRACLES

These are described both in the Old and the New Testaments, and they vary in their credibility. Some of them, such as of the tale told in connection with Elisha of the axehead floating on water, are quite clearly legends which have grown up among a child-like and imaginative people around the figure of a national hero. Others, such as the story of the sun going back on the dial of Ahaz, present a more difficult problem. In this particular instance the phenomenon is described as being proof of the truth of a prophetic utterance. On the other hand, it is clear that if the sun were really to go backwards, that is, if the world were to alter its rotation to the opposite direction, this would upset the whole balance of the solar system. It is inherently incredible that this should occur, and unless He were suspending every known law of nature, it would be impossible for God to effect such a contradictory phenomenon without acting in a manner at variance with the whole scheme of creation. In such a case one must say that whatever may be the explanation of the alleged event it cannot possibly have happened in actual literal fact. Various common-sense explanations have been suggested, such as that an eclipse occurred or that a very heavy thunderstorm caused complete darkness during the hours of daylight; but the real explanation must be said to lie in the fact that what is being described is not a literal or scientific incident at all, but rather some strange spiritual experience of the prophet and the king, which is not to be defined in the language of science.¹

When we turn to the New Testament we still find nature miracles mentioned. Of these one of the best known is the

¹ For a discussion of this see G. Adam Smith, *Isaiah*, Vol. I, pp. 395-398.

stilling of the storm on the lake. Here there is no inherent contradiction of the essential order, stability and working of the universe, as in the case of the sun on the dial of Ahaz; and since God is Creator, Lord and Master of nature there seems no reason "a priori" why He should not control nature in any way He wills, so long as by so controlling it He does not completely overthrow the fundamental laws of the universe and the whole plan according to which He has created and maintains it. If our Lord did control the velocity of the wind and the undulation of the waves, this control would not in any way disturb any other part of nature, and it therefore constitutes no difficulty from the scientific or philosophical point of view. On the other hand, when we come to the question of Jesus walking on the water, this is a more serious departure from the ordinary behaviour of material substance and would involve a certain interference with the general principles of density. At the same time we must recognize that in this case there is a variation between the accounts given in the four gospels, the miracle, as is often the case, being heightened in St. Matthew's Gospel and reduced in those of St. Luke and St. John. It was, in fact, pointed out by Professor A. Nairne that the description given by St. John might well be nothing more than an old man's memory of a peculiarly vivid scene by the Sea of Galilee where, in the wonderful light which plays upon the waves of that beautiful lake, the figure of his Master could be remembered, reflected upon the water as He stood at the side of the lake in such a way as to make it seem that He was walking upon the surface of the waves—an effect which can still be seen by anyone who visits the Sea of Galilee.

To sum up: the nature miracles involve an insurmountable difficulty for the scientist only when their occurrence would destroy the whole harmony and consistent working of the earth or the universe; such miracles occur mainly in the Old Testament and can usually be recognized immediately as being characteristic legends or folk-tales. No sensible Christian would expect that they should be treated as anything more than what they are; and in the reading of the Bible it is essential to remember that it is an eastern book, written

by writers with poetic imagination and not with that extraordinarily dull, unimaginative and literal approach which appears unfortunately to characterize the Englishman, who is usually for this reason one of the worst possible interpreters of the Old Testament. In fact, the writers of the Old Testament would have been astounded had they known that modern readers expected to find precise and scientific accuracy in their descriptions of incidents in the old history of their race. They are using a language which is not the language of science, not even often of exact history, but that of poetry, imagination, drama and symbolism, though it may be presented in a historical context; but the very use made of such material by the writers of the New Testament shows clearly that these incidents were regarded as symbolic types rather than literal descriptions of precise events, and it is for this reason that both the Early Fathers and modern writers such as Sir Edwyn Hoskyns, L. S. Thornton, A. G. Hebert and Austin Farrer relate the typology of the New Testament, to the typology of the Old Testament, by showing that the whole description and setting of certain incidents in the New Testament is not so much historical in form as deliberately symbolic, so that a New Testament event is seen as the counterpart and fulfilment of an Old Testament event. In each case the main interest and importance of the events described is seen not in their precise details but in their symbolic content.

(b) IMAGINATIVE "MIRACLES"

A second class of miracle is that of events which are capable of a perfectly simple explanation but which, to the child-like minds of the peasants who saw them in Palestine, appeared to have a miraculous character. One of these is the miracle of the Gadarene swine. In this case there is an account of a healing miracle which fits into the next class we shall consider, but attached to it is a description of how a herd of swine rushed down a cliff and fell into the sea. To the beholder, starting with a firm belief that all forms of mental disturbance were due to the actual possession of the person concerned by a number of demons, it seemed quite clear and logical

that if these demons were driven out of the affected man, they must find some lodging; and what could be more suitable than that they should pass into a herd of swine, which the Jews considered unclean in any case? The actual historical event which occurred was quite clearly that the maniac, before being healed, passed through a violent paroxysm, as is often the case in such cures, and in the course of this shouted and created a great disturbance. The herd of pigs (probably young) displayed at once that immediate reaction and vigorous activity which is a characteristic of young pigs, as anybody who has kept them will know. Taking fright at the great crowd of people and the disturbance created by the maniac, they at once began to rush without any very clear idea of where they were going, and under the influence of herd-fear they rushed away from the people and fell over the edge of the cliff into the sea. Quite naturally the peasants imagined that this was because they had been possessed by the demons; but it is not necessary that we should accept this charming and imaginative explanation! There is the other perfectly simple, normal explanation of the occurrence. On the other hand, in certain cases we must believe that the account given is not to be taken literally but rather allegorically. For example, when we are told that St. Peter finds a coin in the fish's mouth, we are not to believe that our Lord actually created a particular Roman coin for him to find there. Such a creation of new chemical substance in a complex form (especially in the design of a Roman coin), whilst not *inherently* impossible for the divine power, seems extremely difficult to reconcile with the dignity and rationality of God. A much simpler explanation is that the fish which St. Peter caught was sold by him, and the proceeds of it were the coin which was required to pay the tax.

It is necessary to avoid the use of this method of "explaining away" miracles in cases where it is inappropriate, and it is not to be supposed that the majority of miracles can be treated in this way; but we are surely justified in employing this approach in cases where it is so clearly and obviously applicable.

(c) SCIENTIFICALLY DIFFICULT MIRACLES

A further class of miracles raises much greater difficulties. Of these, examples are the Feeding of the Five Thousand and the miracle of the changing of the water into wine at Cana of Galilee. In the case of the miracle of the Feeding of the Five Thousand the difficulty is very great, because the accounts given in the gospels make it clear that some very remarkable power was exhibited on this occasion, which led to the multitude trying to acclaim Jesus as the national deliverer and hero of the Jewish people.¹ Moreover, the miracle is recounted in all four gospels, and it is made clear that it was in fact a turning point in our Lord's career.² On the other hand, the practical scientific difficulties in the way of accepting this miracle as literal are very great. It involves the creation of vast amounts of chemical substance, "ex nihilo", in a highly complex and developed state; but there are also much more obvious difficulties in the question of mere weight and time. These are described as follows by A. D. Ritchie in his book, *Civilisation, Science and Religion*:

"The story is generally taken in a magical sense to mean that from five loaves and two fishes, weighing two to four pounds or possibly a bit more, something like two tons of food were produced and consumed by the people. Had Jesus handled it all Himself, it would have taken about one and a half hours at one pound per second and a hundred or more helpers would have been needed to distribute it. It is wrong to say that it is scientifically impossible for this to have happened. For science nothing is strictly impossible, though many things are highly improbable. Still, all the scientific knowledge we possess goes to confirm the improbability of such an event. Of course, if we possessed the authentic testimony of a number of independent eye-witnesses who wrote down their narratives at the time, we should have to believe it, science or no science. But we do not; we possess only written narratives of at least a generation later. However, there is no need to suppose that the story is one of magic; in fact, there are cogent arguments against it. If the event had been as interpreted above, the

¹ Cf. especially John VI, 15, and also Mark VI, 45 and 46.

² We note that in the first three Gospels Jesus ceased after this to preach to large multitudes, and concentrated mainly on instructing His disciples.

crowd would just have enjoyed a free meal. The only result would have been a bigger crowd next day wanting another free meal and much annoyed if they did not get it.

“Consider, therefore, another interpretation. Peasants and their like do not generally go out for an expedition without concealing food about their persons; but such people are suspicious of strangers, secretive and close-fisted, and they do not care to feed in public. (Oriental peasants, I take it, are the same, only more so.) Jesus, of course, would know this and would have to find means to overcome their suspicion, secretiveness and greed; to get them to sit down in an orderly way and bring out their food and share it freely with their neighbours, so that everyone had enough. (According to the account there was a good deal left over.) The lad with the loaves and fishes (which he had probably brought to sell) had a necessary part in the scheme by supplying openly and conspicuously *some* food, which Jesus then began to distribute freely; thereby conveying the idea that there was plenty for all and anybody could afford to share with anybody. To get a miscellaneous crowd of people, even for half an hour, to lay aside fear, suspicion and greed, and really share a common meal with strangers or friends or enemies or anybody is, to my mind, a genuine miracle. To anyone who suggests it is not a miracle at all, the reply is, ‘Try if you can do it yourself or anything the least like it.’ Of course, anybody who likes can believe it was magic; there is no way of stopping him. It may be that our scientific theories are badly astray. If it can be shown that by a material transformation a couple of tons of food was once produced out of a few pounds, then it can be done again. Until science has discovered how, it is a poor kind of science, not to be relied upon. The magical view is not so much irrational as worthless. The other provides a small-scale model of the Kingdom of God and a hint as to how to bring it about.”¹

It may be felt that in this explanation Ritchie is being unduly facile, and certainly the difficulty still remains that it is hard to see, if this explanation is correct, why this particular miracle exercised such a critical influence on the development of Christ’s ministry. But on the other hand, if we accept such an explanation as this, it does not in any way lessen our Christian faith; and as Ritchie points out, the test of a genuine miracle is at least primarily its *spiritual* significance and value, and this aspect of the

¹ A. D. Ritchie: *op. cit.* pp. 73, 74.

Feeding of the Five Thousand is perhaps more brought out by Ritchie's explanation than by the ordinary simple magical interpretation.

At the same time, in considering such miracles as this, we must bear in mind that it is clear from the "sermons" of St. Peter and St. Paul as recorded in the early chapters of the book of Acts, and also from the large part which is played by miracles in St. Mark's Gospel, now generally considered by scholars to be the earliest of the four gospels, that the earliest Christians cited miracles as conclusive *evidence* of the power and authority of Jesus Christ. They are described in the book of Acts as "mighty works and wonders and signs", and these earliest Christians clearly considered that they afforded proof that the promised messianic age had come and that the claim of Jesus to be Christ or Messiah was justified by the "mighty works" which He had performed.¹ Now these arguments would have had no value for evangelistic and apologetic purposes unless the "mighty works" in question had been well known to those to whom the Apostles were seeking to commend Christianity. It would be no proof of the power of Jesus to allege that He performed miracles which in fact He had not performed and which could be disproved. The fact that the early Christians could so confidently cite the miracles of Jesus for this purpose is in itself the strongest possible evidence that these miracles were well known and familiar to the Jews of Palestine to whom the Apostles were preaching. Christ must therefore have carried out some actions which at least to all the Jews of that time appeared to be quite definitely miraculous. Again, it seems both from the Gospel of St. Mark and that of St. Luke that many of these were works of healing. For in St. Mark's Gospel miracles of healing predominate over any other class of miracles. Yet on the other hand it is probably just such miracles as the Feeding of the Five Thousand which, above all others, would have convinced the Jews of the divine power of Christ.

While, therefore, if any particular miracle seems to us completely incredible, after unprejudiced consideration of

¹ See C. H. Dodd, *The Apostolic Preaching and its Development* (Hodder & Stoughton, 1936).

all the available evidence for it, we are obviously justified in adopting a rationalizing explanation and in doing so are not being false to our Christian faith, yet we must not apply this method to all the miracles or to every sort of miracle, for then there would be no explanation of the fact that the Apostles offered the "mighty works" as proof of Christ's authority and clearly found them a most effective argument in favour of the messianic claims of Jesus of Nazareth.

(d) MIRACLES OF HEALING

The fourth class of miracles—miracles of healing—fall into several sub-classes, for example, healings of lameness; healings of blindness; healings of deafness; healings of leprosy, palsy and other diseases; healings of mental sickness; and alleged restorations to life. With regard to the first three sub-classes it may be questioned whether these any longer raise serious scientific difficulties. There are so many recorded instances of sudden cures of afflictions falling within these classes, either by shock, or by suggestion or other psychological methods, that it is very easy to produce modern parallels to all the miracles of this type performed by Christ. In many of these cases the real cause of the trouble is in some sense neurotic or psychotic, and amenable to some form of psychological treatment which is effective in dealing with disturbances of this type. Freud, for example, records in his works many examples of cures of paralysis of limbs effected by psycho-analysis. In addition there are undeniable and extremely well attested instances of spiritual healing, not only in connection with particular centres of healing, but also as a result of prayer, laying-on of hands, unction or healing services. It would be impossible here to go into details of this matter, but reference may be made to the book by Leslie Weatherhead, *Psychology, Religion and Healing*.¹

The case of diseases which are due to some form of bacterium or virus is much more difficult. The cure of leprosy, for example, by direct spiritual means is certainly more difficult

¹ Leslie Weatherhead, *Psychology, Religion and Healing* (Hodder & Stoughton, 1951).

to credit from the scientific point of view than a similar cure of dumbness or blindness; but on the other hand instances exist where cures of disease of a bacteriological type have occurred suddenly and inexplicably, and there is no evident reason why the divine power should not be manifested in the control of such minute living organisms. We have protested already against the Cartesian duality which would make a complete separation between body and mind or between the material and the spiritual. In performing healing miracles our Lord frequently insisted that physical healing could not take place until spiritual health had been restored to the person concerned, by the forgiveness of his sins; and it is increasingly recognized that there is a very close connection between mental and spiritual health on the one hand and physical health on the other, so that if a great spiritual power is brought to bear, the effect it will have upon the spiritual and mental aspect of the human being will be inevitably reflected in increased health and resistance to disease in the physical aspect of the same human being. Thus, there is less difficulty in believing in the cure of disease by spiritual power than there was in the 19th century. On the other hand, this fact must never lead us to suppose that there is any conflict between the employment of physical and medical methods of healing and spiritual methods of healing. In the struggle against that form of evil which shows itself as disease, the origin of which we have discussed in a previous chapter, the doctor who employs chemical, surgical, physiological or bacteriological methods is fighting the battle of the Lord just as truly as is the spiritual healer, and the ideal is that both should work together in harmony and co-operation, the doctor making use of the tremendous added power of prayer, faith and spiritual healing, and the spiritual healer availing himself of the wisdom, experience and knowledge of the doctor.¹ Almost all medical science and work for the sick began in Christian hospitals initiated by the Church, and the

¹ For a splendid short statement of Christian doctrine on this matter, see the Presidential Address to York Convocation by the Archbishop of York (Dr. Cyril Garbett) in October, 1952: *Journal of York Convocation*, pp. 15-19, (October, 1952).

healing power which Christ promised should continue in His Church is today manifested in the miracles of modern medicine and surgery as truly as it is in the revival of spiritual healing. When we consider the full extent of the development of our control over organic and other disease, it is obvious that a very great many of the New Testament miracles of healing, which in the 18th or early 19th centuries would have been dismissed by rationalists as quite incredible, are now paralleled and even surpassed by the ordinary practice of modern medicine and spiritual healing. This should lead us to be wary in refusing to believe in the possibility of such healing miracles on the part of Christ.

Passing on to the matter of mental illness, we find a similar position, due to the enormous increase in our knowledge of the power and working of the unconscious mind which has been gained by psycho-analysis and psychiatry. While it is true that the capacity of doctors to cure mental disease is still severely limited, e.g. in respect of General Paralysis of the Insane, yet it is much easier for us than it was for our ancestors a hundred years ago to understand how the personal power of Christ could effect the healings of "demoniacs" recorded in the Gospels. These healings were indeed evidence of the strength and spiritual power of His personality, but they were not incredible or miraculous to the degree that was formerly supposed. Here again it is true that the language in which these events are described may sound superstitious or childish to the modern ear; but whatever may be the terms used, the events described are no longer incomprehensible, nor do they really present any difficulty from the scientific point of view.

Finally, we have to consider the very few cases of restoration to life. There are in the Gospels only three such cases recorded. The first is the case of the young girl, Jairus' daughter. In this case our Lord Himself said that the girl was not dead, but sleeping. He was laughed to scorn by those around Him, but He had no difficulty in raising her up. Our evidence will not permit us to say definitely whether this was a restoration to life or merely a raising of one who was in some form of coma. But it is at least possible that the bystanders

were mistaken in supposing the girl to be dead, and the many recorded instances of premature burials, particularly in the primitive countries of South-East Europe and Asia, where medical knowledge was limited, even in comparatively recent times, show how easy it is for uninstructed bystanders to mistake a temporary coma or paralysis for death. Such a mistake, however, is not likely to be made by one in Whom is the wisdom of God.

The same explanation might easily apply to the second recorded instance of restoration to life in the Gospels, that of the son of the widow of Nain. Again, we have no evidence to enable us to decide which of the two explanations is correct; but any scientifically-minded person who finds a difficulty in believing that in these two cases the person concerned was restored to life would certainly be entitled to accept the second explanation, that of a temporary coma or paralysis.

The third recorded instance of restoration to life in the Gospels is much more difficult and raises problems concerning the nature and criticism of the Fourth Gospel which are outside the province of this book. This is the raising of Lazarus. If the account given in St. John's Gospel is intended to be a strict literal account of an actual event, then the conclusion is inescapable that in this case there was an actual restoration to life. St. John states definitely that the body of Lazarus had been buried and laid in the tomb, and the elder sister states that by now it is in a state of decomposition. While it is just conceivable that again this might have been a case of coma or suspended animation, all the recorded evidence goes to suggest the opposite. Moreover, according to St. John this restoration, unlike the other two we have mentioned, produced important reactions both on the bystanders and on the leaders of the Jews, and in fact led to the decision to bring about the death of Jesus. On the other hand, the whole of St. John's Gospel is of a highly symbolic nature. The writer is far more interested in the allegorical, or parabolical, and spiritual significance of what he records than in its historical character. And yet, on the other hand, in many cases he does correct details of historical events

recorded in the earlier Gospels, so that we are faced with the fact that he combines an intensely sacramental and symbolical attitude with a genuine interest in historical accuracy. On the whole it seems likely that the raising of Lazarus is intended to be the account of an actual historical event, though in this case it is at least peculiar that so critical and important an incident in the ministry of Christ is not even mentioned in the first three Gospels. But if we are to assume that the raising of Lazarus is in fact a restoration to life, is this in itself impossible to accept from a scientific point of view? Surely it does not really raise any greater scientific difficulties than the many recorded cases of people whose hearts have stopped and whose life has literally been extinct, sometimes for periods at least of many minutes, if not of hours. It is in fact only a slightly prolonged instance of the same thing; and once again it is surely reasonable to suppose that the tremendous life-giving and revitalizing power of the divine Lord would be capable of restoring the functions of animation to a body in which they had for a time ceased.

(e) FUNDAMENTAL MIRACLES

The last class of miracles which we must consider is entirely different in importance from those which we have previously discussed. It is in fact questionable whether the term "miracle" is entirely applicable to them, in view of the fact that they are events which constitute a fundamental part of Christian faith and are integral to the Christian revelation of God. The first of these is the Virgin Birth of our Lord Jesus Christ. This event is one which causes, or certainly has caused in the past, intellectual difficulty to large numbers of scientists. Indeed, if we believed that Jesus of Nazareth was an ordinary human being, albeit the greatest of prophets and teachers, we might find insurmountable difficulties in this miracle. For it is contrary to the ordinary course of nature that any human being should be born without the union of male and female seed. At the same time it may be admitted that there have been reported extremely rare cases of such a thing occurring; but we should obviously treat with a high

degree of incredulity any suggestion that such a thing had happened. But if for other reasons we believe that Jesus of Nazareth was not an ordinary human being, but was God Himself incarnate in human nature, it must follow that it is no argument to say that because a thing has not happened and does not seem reasonably possible in the case of an ordinary human being, it cannot have happened in the case of Jesus Christ. In fact, it seems probable that if Jesus Christ was God, His coming into the world would be marked by some unusual course of events, and also by some evident combination of humanity and deity. If it is objected that such an event is impossible with God, this would place an arbitrary limit upon the power of God. Since God is by His very nature omnipotent, within the limits we have defined earlier, and belief in a God who is not omnipotent can never be logically or intellectually satisfactory, it could not be held that it is *impossible* for God to bring about the Virgin Birth of our Lord Jesus Christ. Moreover, although the production of an infant from the female ovum without the intervention of the male seed may raise difficulties on the biological and genetical side, there seems no scientific problem about it from the physical, chemical and biochemical sides. The germination of an ovum is fundamentally a chemical and physical process, and chemical and physical process can be set in motion by varied chemical and physical forces in accordance with the ordinary laws of nature. Little enough is yet known as to the influence, for example, of various types of radiation upon such a chemical substance. It does not seem unreasonable to suggest that all that is required from this point of view to bring about such a virgin conception is the direct intervention of the energizing and vitalizing power of God, which would not in itself constitute any serious departure from or interference with the ordinary processes of nature. Therefore we may conclude that the question of the Virgin Birth of Jesus Christ cannot be settled in any "a priori" way, but only be a consideration of the historical evidence for the occurrence of it.

It is worth pointing out that the Virgin Birth did not occur in isolation, but was one of a number of miracles

which happened in connection with our Lord's life and ministry. As we have already seen, it is impossible to doubt that remarkable and unparalleled occurrences, well known to all the Jews living in Palestine in the time of our Lord, did take place during His lifetime on earth, and that they were so generally known that they could be used as strong evidence of His divine authority. There is, therefore, no obvious reason why, if miracles of this type occurred, other miracles such as the Virgin Birth should not also have occurred through the same divine power. But the important thing is to consider the historical nature of this particular event. It is recorded in the Gospels of St. Matthew and St. Luke, which are known to have been written in their present form about A.D. 80 or 85; and it is very probable that the Birth narratives were circulating verbally, if not in writing, in the Church some years earlier than this. Either these narratives are based on fact or they were invented. In support of the former conclusion it may be pointed out that elsewhere St. Luke displays a considerable interest in history, and is usually regarded as a reliable source of information. St. Matthew is rather less reliable in historical details, particularly in these early chapters; but it seems exceedingly unlikely that either he or St. Luke would have deliberately invented such an occurrence. It must be remembered that unless they or other Christians invented the story about the time these Gospels were written, it must have been circulating within the life-time of the Blessed Virgin Mary herself; and it seems incredible that such stories, if untrue, could have been told while she herself was alive to deny their veracity.

Again, we must consider what motive the evangelists could have had for inventing these stories. They were never used as evidence for the divinity of Christ, the Resurrection being always regarded as wholly adequate for this purpose. If they were invented it must have been from a childish and foolish desire to embroider the Gospel story with portents and wonders. We know that such a process did take place in the apocryphal gospels; but the difference between these (which were rejected by the Church) and the four canonical Gospels which were accepted as reliable shows that the Church

tried its best to maintain sober truth in its records and to exclude any magical or fanciful elements. If, therefore, these Birth narratives were accepted by the Church, whose faith in no way depended upon them, it can only have been after careful consideration and inquiry.

But we can go further than this. The doctrine of the Virgin Birth must have been a source of some embarrassment to the Church. It was obviously in Jewish-Christian circles that such stories first became known, and these were exactly the circles in which they would prove least palatable. To some of the Jews they must have savoured of the "lustful mythologies of paganism". At this time the seventh chapter of Isaiah was not yet interpreted as suggesting that the Messiah should be born of a virgin. Virgin birth was not to the Jew a sign of honour, since virginity was not more highly esteemed than honourable marriage. The story also exposed our Lord to the allegation of having been born out of wedlock, and there are in fact signs in the Fourth Gospel that this allegation was made.¹

There would seem, therefore, to be no reasonable motive for the invention of this story, and, indeed, strong motives against it. The fact that it was current and accepted within so comparatively short a time after the death of our Lord suggests that it must have been based on actual historical fact; and since we have already ruled out any absolute philosophical barrier to its occurrence, there is no reason why we should not accept the historical evidence as conclusive. Opinion in the Church differs as to the importance of this doctrine, but the fact remains that it is embodied in the Apostles' Creed and that it does seem to carry important evidential results as to the nature of Jesus Christ and the doctrine of God. Thus, since there is no scientific or philosophical objection to accepting the fact of the Virgin Birth, and the historical evidence suggests it is true, it would seem capricious and unjust for a scientific person to reject lightly or frivolously this important element in the Christian faith. However, it is probable that few would be prepared to say that a man cannot be a sincere and convinced Christian

¹ John VIII, 41.

because he harbours intellectual doubts about the Virgin Birth.

When we turn to the other and most fundamental event in the Christian revelation, namely, the Resurrection of our Lord, the position is different. St. Paul is quite explicit that the Christian who rejects this event has no sure foundation whatever for his faith.¹ In the case of the Resurrection there is perhaps not quite the same incredulity on the part of scientists as seems often to be felt about the Virgin Birth; but the considerations which apply to its possibility are somewhat similar. The Resurrection involves two distinct things—first, the disappearance of the material body of Christ from the tomb, and second, His corporeal appearance to the disciples after His death. Many explanations have been attempted of the Resurrection on the assumption that the post-Resurrection “appearances” of Christ were due to visions, or spiritual experiences, or imagination on the part of the disciples. But if the accounts given in the Gospels are accurate, such an explanation is untenable, since the disciples had concrete evidence of the corporeal actuality of the risen body of Christ. We are faced, therefore, with the fact that a body composed of chemical substances and physical atoms was dissolved by some divine power and reappeared from time to time. Again, we may say at once that such a thing could not have happened to any normal human man; but this was God Himself incarnate in a human body, and we cannot so limit the divine power without being involved in intellectual contradictions through a denial of divine omnipotence. However difficult, therefore, it may be to explain how such an event could have occurred, it would be illogical to deny from the start its possibility, when the power of Almighty God Himself is concerned. What is here involved is a control of matter and possibly a re-creation of it; but since we believe that all material things were created by God, have their origin from Him and are dependent upon His will, it must follow that such an act of re-creation is no more incredible than the original act of the creation of the material universe.

¹ I Corinthians, XV, 13-19.

It is essential that, as we have already suggested, we should distinguish between an event which is logically impossible or rationally paradoxical and absurd, and an event such as the Resurrection which, while it may lie outside the ordinary course of natural occurrences, is not in conflict with the over-all design and plan of nature, but rather in harmony with it and essential to the Christian understanding of the purpose of existence and of nature itself. The natural laws of science, as we have previously recognized, are now acknowledged to be simply statistical generalizations of the normal behaviour of material objects. But such an abnormal situation as the death and Resurrection of Jesus the Christ might reasonably be expected to stand outside the usual and statistically average behaviour of living bodies. It does not become incredible because it will not fit in with normal scientific laws or the usual course of human life and death and the records of biological science. From time to time events happen which do not accord with the recognized general principles of science, and when such events occur on a number of occasions or even on one or two occasions they may necessitate a modification of the law as previously stated. It is not the procedure of modern science to say that an event cannot happen because the laws of science, as we understand them, forbid it. Rather is it the procedure of science to examine and consider the evidence for the event; and, if the occurrence can be established, to reconsider the scope and accuracy of the scientific law concerned. In the case of the Resurrection it is not necessary to reconsider the scientific laws of decomposition of a dead body or of the behaviour of the cells of a human body, since, as has already been stated, this case cannot be regarded as a usual one or as liable to recurrence. If such a resurrection as that of our Lord occurred in the case of an ordinary human being, or (even more) of a number of ordinary human beings, then we should be required to reconsider the scientific laws concerned. But since this happening is in its very essence unique, it does not require a reconsideration of scientific laws which are perfectly valid in their application to normal events or to an ordinary human body. At the same time we have no

right to deny beforehand the possibility of such an event, merely because it does not accord with normal scientific laws as we know them. We should be compelled to deny it if it were logically impossible or if it were manifestly in complete conflict with the whole purpose and design of the world and its rational and intelligible character; but so far from being of this type, the Resurrection, as has already been said, is something which harmonizes with and indeed renders intelligible the whole purpose of existence. It is not merely in accord with God's purpose and plan but essential to it, and can be so recognized by the human mind and reason. Therefore, the decision whether or not the Resurrection took place can only be made in terms of history, and by a consideration of the evidence for the occurrence of the event. Having thus disposed of any prior objection to the idea of a disappearance of the material body of Christ from the tomb or His corporeal appearance to His disciples after His death, what must now concern us is the weight of the evidence for the occurrence of these events, which we will consider separately.

In regard to the empty tomb, our evidence is to be found in the Gospels. The fact is recorded in all four Gospels, and while there are certain divergences in the accounts, which are only to be expected when the details of a story have been handed on by word of mouth for a whole generation at least without ever being written down, yet essentially the stories are the same. In each case the tomb is recorded as having been sealed with a heavy stone, as was usual among the Jews; and according to St. Matthew's Gospel it was in fact guarded by the representatives of the Chief Priests and Pharisees. All the narratives agree that Mary Magdalene, and (in most accounts) other women, found the huge stone rolled away from the door of the sepulchre. In all four Gospels the women saw a vision of angels and afterwards went and told the disciples (except, possibly, in St. Mark's Gospel).¹ According to St. Matthew the soldiers told the Chief Priests that the body of Jesus had disappeared and were bribed by

¹ Some scholars believe that Mark XVI originally ended at verse 8, and all agree that the present ending is a later addition.

the Priests to say that His disciples came by night and stole Him away. It is, of course, possible that these stories were invented by the early Christians: but there are extremely strong objections to this which we will consider in a moment, and these objections apply equally to the idea put forward by the Chief Priests, that the body had been stolen. Failing this we are forced to the conclusion that the tomb was in fact empty, and this cannot be accounted for through human agency. Various other explanations have been suggested—for example, that of which George Moore makes such beautiful use in his novel, *The Brook Kerith*, namely, the suggestion that Christ was not in fact dead, and that He revived in the tomb and walked out of it of His own accord. Such an explanation ignores the fact that it was common to put a large stone, incapable of being moved by one man from the inside, in front of a Jewish tomb. Unless, therefore, the whole story was invented by the evangelists, or, alternatively, the disciples stole the body and pretended that He had risen, or hid Jesus after He had recovered from His unconsciousness, the miracle must have occurred. But if we consider the situation immediately before and after this event, the effect of it upon the disciples becomes completely inexplicable, if it either did not occur at all or was a trick which they themselves had carried out. For the Gospel story makes it very clear that, as we should naturally expect, the crucifixion and death of Christ seemed to His disciples the tragic ending of all their hopes. It is clear that the idea of His Resurrection was so strange and incredible to them that when He spoke of it before His death they either did not understand what He meant or, if they did, never took it seriously. Yet it is equally clear both from the early chapters of the book of Acts, and from the very fact of the existence and spread of the Christian Church in the 1st century, that some event must have caused a complete and sudden transformation of the whole attitude and character of the disciples. It is far more incredible that a small dispirited band of men, whose hope was lost, should have been impelled by a trick which they themselves had played, or by an event which had never happened, to become the dynamic, courageous and

vehement force which the apostles clearly were after the first Easter Day, than that the Resurrection should actually have occurred. It is the behaviour of the apostles in those days after the first Easter Day and the formation, existence and drive of the early Church which are the concrete facts which dispose of the possibility that the story of the empty tomb was invented, or that it was a trick devised by the disciples themselves. Therefore, having approached the question without any preconceived judgement, we can reasonably conclude that the historical evidence for the empty tomb is exceedingly strong.

Yet it is significant that St. Paul and other New Testament writers, when setting forth the evidence for the Resurrection, never mentioned the empty tomb, probably because they themselves were aware that it might be questioned by malicious people, however stupidly, and that the second line of evidence (namely, the post-Resurrection appearances of our Lord) was even stronger and more convincing. In the 15th chapter of his first Epistle to the Corinthians St. Paul makes the definite statement that Christ was "raised on the third day according to the scriptures", and he then goes on, entirely in accordance with the modern scientific or historical spirit, to cite a number of specific witnesses to the different occasions on which the appearances of the risen Christ took place. In all he mentions six different appearances. In three cases there were appearances to single individuals, and such appearances might, of course, be attributed to imagination, delusion or some form of spiritual vision. But the other three appearances which he mentions were to groups of people, in two cases to all the Apostles and in the other case to above five hundred brethren at once. It seems difficult to believe that all twelve Apostles could have imagined the same delusion at the same time; but it is surely incredible that above five hundred people of all sorts and types should *imagine* that they had seen Christ at the same time. To suppose that so large a number of people could suffer from the same delusion is quite unreasonable. St. Paul obviously feels that this is the strongest piece of evidence of all, for he continues that "of these five hundred brethren the greater

part remain until now" (i.e. the date when I Corinthians was written, about A.D. 55), and that any of his readers who doubts the historical truth of the Resurrection had better go and find some of these brethren and ask them for himself. This appeal to first-hand testimony is surely the most scientific approach which could be adopted.

When we turn to the Gospels we discover that in fact there were other appearances related in the narratives current in the early Church. These, unlike the occasion of the appearance to the five hundred brethren, are appearances to single individuals or small groups; but they are to various types of individuals at various times and in various circumstances. Such a list of occurrences does afford strong evidence for the fact that the Resurrection took place. Had it been a case of a single appearance to one individual or even to a group of individuals, it might have been thought to be an hallucination; but it is inherently unlikely that so many different individuals at so many different times and places should have suffered from the same hallucination. Moreover, if the details recorded in the fourth gospel are historically accurate, it seems clear that the risen body of Christ was no mere spiritual vision but an actual corporeal body, in fact, the body which had been His during His earthly life, transformed and glorified in a subtle way. The same fact is brought out by the story recorded in St. Luke xxiv, 26-43, where we are told that when the Apostles first saw Christ they quite naturally supposed that they had seen a ghost, and He said, "Why are ye troubled? and why do thoughts arise in your hearts? Behold my hands and my feet, that it is I myself: handle me, and see; for a spirit hath not flesh and bones, as ye see me have." He then asked for food, and when they gave it to Him "He took it and did eat before them". If we are to place any reliance upon the historical accuracy of these records, it must follow that the idea that the Resurrection was a mere spiritual vision does not fit the recorded facts.

Finally, it is hard to believe that an hallucination or the imagination of a moment could produce such a permanent and lasting effect on the minds of those who saw it as was in fact produced on the minds of the Apostles and early Christians

by the Resurrection appearances, which, as we have already said, transformed them from a small group of listless and despondent men into a dynamic company of fearless fighters and evangelists. On the other hand, the assurance of the actual presence of Christ with them, and His obvious victory over death would produce precisely such a result. For theological reasons, into which we need not now enter, nothing but a true corporeal Resurrection would be sufficient to afford that foundation of the whole Christian faith which St. Paul and other New Testament writers find in the Resurrection. Our Lord himself, when asked by the Jews to give a sign of His divine authority, said that there should be no sign given them but the sign of His rising again on the third day. In other words, He said, "I have made certain claims and given certain teaching. You will know whether my claims and my teaching are true, because I also claim that I shall rise from the dead on the third day. If I do this, which no human being can do, that will be proof, and the only necessary proof, to you of my divine authority and of the truth of my claims and teaching." Such proof could only be afforded by a Resurrection in actual corporeal fashion, such as to allay all doubt. It could not be given merely by a vision or hallucination. Yet the Apostles and other Christians obviously regarded their experience of the risen Christ as completely adequate proof of His claims and used them for this purpose in every proclamation of the Christian Gospel. We are therefore compelled to say that the evidence for the occurrence of the Resurrection is overwhelming. If it is objected that no reference to it can be found in contemporary documents, it may be asked, In what documents could such reference be expected? Those who regard the evidence for the Resurrection as historically inadequate may well be asked what other sort of historical evidence could reasonably be expected for an event that occurred in a small rural colony of the Roman Empire nearly 2000 years ago. We therefore conclude that there is no reason why a scientist should not be prepared to accept the supreme miracle of the Resurrection without in any way being false to his scientific principles or to the proper use of his reason.

There are one or two other events in the life of our Lord which fall into the category of miracle and to which the general considerations applying to the Virgin Birth and the Resurrection would also apply; but it must suffice for our purpose to have discussed the two outstanding examples of this type of miracle.

CHAPTER II

CREEDS¹

ANOTHER point on which particular difficulty has been found by many scientists in relation to the Christian religion is the use of creeds, and the requirements in some, though not in all, branches of the Christian Church that assent should be given to creeds. The objection felt by scientists on this score has been voiced by a number of writers, but one of the best and most direct statements of it is to be found in the Riddell Memorial Lectures for 1941 by Sir William Bragg.² After summarizing the nature of faith in science, and particularly the nature of scientific hypotheses and theories, and the importance of probability in science, Bragg refers to the need to abstain from dogmatism, which need, he says, science teaches continuously. He then describes what he calls the "years of acute misery and fear" which were caused to him in youth by the insistence upon the literal interpretation of biblical texts; and he pleads that theological dogma should be treated like the scientist's hypothesis. He points out that science can never be content to accept without question the dictates of authority, and he concludes by suggesting that the demand for the absolute acceptance of definite items of faith as a preliminary condition to membership of the Church is to many minds an impossible demand. "Conviction of the truth of any faith, so far as a man can measure the truth, is to be gained by practice, and it is here that the scientist finds an illustration in his own work. Every man, in the circle in which he finds himself . . . can try the Christian way, and discover

¹ Since this chapter was written, an admirable discussion of the use of creeds and the question of authority has appeared in R. H. Thouless, *Authority and Freedom* (Hodder and Stoughton, 1954).

² W. H. Bragg, *Science and Faith* (Riddell Memorial Lectures, Oxford University Press, 1941).

for himself and acquire his own convictions. He tests his faith."

This statement by one who was himself a Christian and a famous scientist is a very fair indication of the problem raised for scientists by the use of creeds in the Christian Church. (Many far more extreme statements could be quoted from those who are unsympathetic to Christianity.) It has already been pointed out that the whole training of a scientist inclines him to question and doubt any assertion, particularly of a dogmatic nature, and to demand some sort of relevant evidence, factual, experimental or experiential. Again, since the time of Newton it has been an axiom in science that hypotheses should be kept to the minimum possible. Newton's famous saying, "Hypotheses non fingo", has become a fundamental element in the training and outlook of a scientist.

In his own work the scientist, in principle, should never be content to accept any statement on the authority of another person: he should perform the necessary experiment to confirm it himself. In practice this is, of course, quite impossible, since it would mean that every individual scientist would have to repeat all the experiments ever carried out by his predecessors in his own particular branch of science, if not also in other branches. But none the less the principle remains that a scientist should not accept any statement, the evidence for which he could not himself examine by experiment and observation if he thought it necessary to do so. It is also true that every statement put forward by any scientific worker is invariably checked and tested by some other workers in that field and, if found not to be capable of being supported by experimental evidence and observation, is rejected. Dr. Eric Ashby writes: "Another, subsidiary, faith[†] which the scientist has is his faith in his fellow-scientists. No scientist can verify everything for himself. Therefore he has to rely on the assertions of his colleagues. So even in modern science there has to be reliance upon authority. But authority in science is never sacrosanct. In mediaeval times it was sufficient to quote the authority and the argument was ended. Today the most humble and

[†] I.e. Subsidiary to his faith in the order of Nature. See Part I.

junior scientist can question the highest authority, provided he does so with reliable observations and sound deductions from them. Modern authorities are never regarded as infallible: they are simply men who have made comparatively few mistakes, and therefore other scientists are able to put a conditional faith in the reliability (which means 'repeatability') of their results."¹

Thus, while authority is recognized in science, it is a different type of authority from that which is recognized in religion and especially in the creeds. This must lead us at once to the question of the authority of the Creeds and the authority of the Church, and that is a subject on which there is crucial disagreement between different branches of the Church.

In the Roman Church the authority is the personal authority of the Pope when giving an utterance "ex cathedra" with the full weight of his office. Moreover, this authority is held to be entirely and completely binding. It is allowed to anyone in the Church of Rome to question a matter before it is made a dogma by such "ex cathedra" utterance; but, however much he may have questioned it before, he must not question it afterwards, but must submit his mind and will to the authority of the Pope. "We, with the approval of the sacred Council, teach and define that it is a dogma divinely revealed, that the Roman Pontiff, when he speaks 'ex cathedra', that is, when, discharging his office of pastor and teacher of all Christians, by virtue of his supreme apostolic authority, he defines a doctrine regarding faith or morals to be held by the Universal Church, by the Divine assistance promised to him in Blessed Peter, possesses that infallibility with which the Divine Redeemer willed that His Church should be endowed for defining doctrine regarding faith and morals: and that therefore such definitions of the Roman Pontiff are irreformable of themselves, and not from the consent of the Church. But if anyone presumes to contradict this our definition (which may God avert), let him be anathema."²

¹ Eric Ashby, *Science and the People*, p. 17 (Casement Publications, Ltd., Bombay, 1953).

² Chapter IV of the Constitution "Pastor Aeternus", issued by the Vatican Council of 1870. Translation cited from *The Old Catholic Movement* by C. B. Moss.

Such autocratic authority as this has never been claimed elsewhere for any individual in the Christian Church. It can hardly be accepted by a scientist unless he is prepared to keep his religious faith and his scientific knowledge in water-tight compartments, as some are. The older conception of authority in the Church may be illustrated from the Book of Acts (Chapter XV) and the account given there of the Council at Jerusalem. Here a question had arisen which required settlement; and it was decided not by reference to St. Peter, who, in fact, does not appear there to be recognized as occupying the chief position, nor to the Apostles alone, but to a *representative council* consisting of delegates from the Christian churches which had been founded in various cities at that time, including certainly representatives of the Christian ministry, and probably of the laity also. The matter was decided by discussion and the result was approved by general acclamation. Following this practice, during the next thousand years representative councils were held from time to time in various places, to which came delegates from various provinces and dioceses; and, in spite of all their human imperfections, the principle was maintained that the authority of the Church is exercised by a decision made by a representative general council of the whole Church, and thus "from the consent of the Church". Moreover, it was not at any time argued that the decisions of a general council were infallible, or "irreformable", as those of the Pope are now held to be, and from time to time decisions of an earlier council were in fact revised by a later council. At the Reformation even this degree of authority was rejected by the more extreme Protestants; but there was substituted for it the conception of the literal and verbal infallibility of the Bible, which, as Sir William Bragg points out, leads to the most unfortunate consequences. In the Church of England, however, the principle of authority is less simple and rests primarily on the general teaching of scripture and secondarily the teaching of the Early Fathers and the councils of the Church. So far as present-day decisions are concerned, these are given in matters of doctrine, worship and faith through the Convocations, which are the synodical councils of the

two provinces of Canterbury and York. Here again, however, no doctrine put out by the Convocations, or in the formularies of the Church of England, is regarded as having that unquestioned infallibility which is presumed in the Church of Rome to adhere to utterances of the Pope, and all statements of doctrine are subject to the test of reference to Scripture.

In the Free Churches various types of authority are recognized, though the authority of the Bible is usually emphasized. A certain degree of authority, however, is given sometimes to general assemblies, as in the Methodist Church and the Church of Scotland, while in the Congregational Church each congregation is regarded as having entirely independent authority, and in the Society of Friends no creed or doctrinal statement whatever is accepted.

Thus there is a wide divergence in the interpretation of the nature of authority in the Church in various parts of it. It is, however, true to say that in the Church of Rome, in the Eastern Orthodox churches, in the Church of England and the other churches of the Anglican Communion, and in the Old Catholic churches, and even in some of the Free Churches, the Apostles' and Nicene Creeds are recognized as having the full authority of the Church. In particular Churches other doctrinal statements are regarded as having a certain lesser degree of authority, for example, the Thirty Nine Articles and the Book of Common Prayer in the Church of England, and the Westminster Confession in the Church of Scotland.

We now pass on to consider the two general Creeds of the Church. The authority of the Nicene Creed derives in the first instance from its having been accepted by a representative council at Nicaea in the year 325. The Apostles' Creed, on the other hand, while it has been affirmed by many councils, was not specifically drawn up by a particular council, but rather grew up primarily as the baptismal confession of faith within the first two centuries of the Church's life.¹ The growth of the Apostles' Creed is particularly interesting in view of its very close similarity to the doctrinal skeleton of the preaching of the very early and,

¹ See J. N. D. Kelly, *Early Christian Creeds* (Longmans, 1950).

indeed, the apostolic church.¹ If we consider the particular phrases of the Apostles' Creed, we shall see that the majority of them refer not to doctrines, but rather to particular historical incidents, e.g. the Virgin Birth of Christ; His Passion, Crucifixion, Death and Burial; His Resurrection, and His Ascension, or, to use the original Pauline phrase, His "Exaltation in triumph into heaven". The latter part of the Creed expresses belief in the existence of the Holy Spirit, the Christian Church, the fellowship of Christians, the forgiveness of sins, the resurrection of the body, and eternal life; while the first section affirms belief in the existence of God the Father, and His creative activity. With regard to the first section, we have already explained in the first part of this book how this belief is a fundamental presupposition of science. If such belief is indeed unjustified, then the fundamental faith of scientists, or at least of the scientific pioneers of the 16th and 17th centuries, was also unjustified. The events recorded in the second section are historical events, the evidence for which we have examined in the previous chapter in connection with the Virgin Birth and the Resurrection. Just as in connection with the Resurrection the important point is not so much the empty tomb as the continued presence of Christ with His disciples, so in the case of the Ascension the important thing is not whether any particular event or mechanism of corporeal ascension from the ground took place, but rather the fact that when His work on earth was completed and His ministry fulfilled Christ returned to His heavenly glory, having triumphed over evil and death, as the representative of man.

The only phrase which might raise any factual difficulty is the sentence "He descended into hell". Some confusion arises here from the fact that the Hebrew words "Sheol" and "Gehenna" are both translated in the Authorized Version of the English Bible by the word "hell". This word itself in mediaeval English meant simply a covered-in place (hence the name helier for a thatcher); but in later times it came to be associated exclusively with the meaning of the

¹ See C. H. Dodd, *The Apostolic Preaching and its Development* (Hodder & Stoughton, 1936).

Hebrew word "Gehenna", though even Gehenna originally meant rather a place of purification by fire than a place of total destruction. But the word "Sheol" has no such theological connotation. It expressed simply the next stage of existence after death (although to the old Hebrews this was a very shadowy form of existence). But the phrase "He descended into hell" really means no more than that Jesus Christ shared the next stage of human life, just as He shared fully in our earthly life. The evidence for this is admittedly scanty, depending upon one or two doubtful texts in I Peter¹ and on certain implications in the Fourth Gospel; but on the other hand the belief may rest, as do many parts of the Christian gospel, on the verbal teaching of the Apostles, handed down by word of mouth for thirty years and more before it was first written down in connected form. It is, however, interesting to note that this particular phrase was added later to the rest of the Apostles' Creed.

The original basis of Christian belief is the first-hand personal testimony of the Apostles and first disciples themselves. They were eye-witnesses of the Resurrection and of other events in the earthly life of Christ; and in fact it is stated in the book of Acts that the qualification for being considered as an Apostle was that one should have accompanied the Lord Jesus through His earthly ministry and been a witness of His Resurrection.² This great emphasis from the earliest days on the personal testimony of actual eye-witnesses is a clear sign of the truly scientific attitude which Christians have adopted, right from the beginning, to the historical facts on which their faith rests.³

Secondly, the particular articles in the Creed rest upon, and can be confirmed by reference to, the writings of the New Testament; and, as the Church of England has always affirmed, "Holy Scripture containeth all things necessary to salvation: so that whatsoever is not read therein, nor may

¹ See E. G. Selwyn, *The First Epistle of St. Peter* (Macmillan, 1947).

² Acts I, 21, 22.

³ Cf. I John, I, 1, 3: "That which we have heard, that which we have seen with our eyes, that which we beheld, and our hands handled, concerning the Word of life . . . that which we have seen and heard declare we unto you also."

be proved thereby, is not to be required of any man, that it should be believed as an article of the Faith, or be thought to be necessary to salvation." (Article VI.) Thirdly, it is significant that the Apostles' Creed was of gradual growth. Although the Nicene Creed was enunciated by the Council of Nicaea, yet it did not appear "de novo" with no growth behind it. In fact the Creed which we use and call the Nicene Creed is not precisely that put out by the Council of Nicaca, but a creed considered and used by the Council (probably very similar to the catechetical creed of Cyril of Jerusalem).

Thus growth is characteristic of creeds. Many credal statements have been put forward in the life of the Church, but the vast majority of these have been rejected. Similarly, many heretical doctrines have been put forward, but again in course of time these have been rejected; and the rejection has always been due to the fact that gradually it became apparent that either the intellectual implications of the doctrine were unsound, or that the moral implications of it were unrighteous, or that the actual practical consequences of holding such doctrines showed that they were untrue. In the course of the evolution of Christian creeds our Lord's own words—"By their fruits ye shall know them"—have been the ultimate test. Those creeds or credal statements which, having been examined intellectually by the most acute intellects of Christendom for 1500 years, were found to be theologically, philosophically and logically adequate; which were found by the greatest spiritual masters, moral philosophers and theologians to be ethically satisfying; and which were found by the corporate experience of the whole Christian community to be morally and spiritually "edifying" (i.e. building up) in their results, were those which survived. It is a totally wrong idea to imagine that the Christian Church blindly imposes upon its adherents assent to outworn primitive documents merely because they happen to be many centuries old. The vast majority of such statements have in fact been discarded. Those which are still recognized and revered by the Christian Church are precisely those which have best stood the test of intellectual examination and moral

and spiritual result over 1500 years. Here again, the test that has been applied is a characteristically scientific one, a combination of reason and experience. The heresies which have been condemned have not been so discarded because they were innovations, but because, in the light of trial, they proved to be unsatisfactory or unsound. They were cast off for reasons analogous to those for which the Ptolemaic astronomy and the Phlogiston theory were discarded. Thus, the two great Creeds of Christendom—the Apostles' and the Nicene—can reasonably claim respect from scientific thinkers, because they have themselves been subject to a scientific type of test. On the other hand, it must be confessed that in the case of the Nicene Creed the theological statements concerning the divinity and humanity of Christ are couched in places in the language of the 4th century. But against this it must be recognized that theological terms, though they may be derived from the philosophy of the 4th century, have in course of time acquired a definite and well-defined content, just as the technical terms of science do likewise. It may be that new terms may sometimes be required for the full description of these doctrines today; but it would normally seem better to effect the necessary development by giving added content to the existing technical terms, rather than by inventing new technical terms, just as in science we retain the term "atom", although the ideas described by this term are now very different from those implied by it seventy years ago.

Moreover, we must recognize that here again the question of different languages comes in. We must not expect statements in theology or in spiritual experience to be expressible in the same language as scientific statements. There is a proper language for history, a proper language for science, a proper language for poetry, and a proper language for theology; and it is ridiculous to suppose that a language which is adequate to express the realities of science will be equally adequate to express the realities of theology, any more than the reverse is true. Moreover, we cannot necessarily ascertain spiritual reality or truth by the same type of tests as those which we use to ascertain scientific reality or

truth. This is the fallacy of those who, like the late Bishop Barnes, propose to discover whether the act of Consecration produces any alteration in the substance of the bread and wine in the Holy Communion by applying chemical tests to them. It may be noted that no Christian theologian has ever suggested that any *chemical* or *material* change took place in the bread and wine at the Consecration in Holy Communion. What is believed is that a change takes place in its significance or value. To use Thomistic terms "the substance" of the bread and wine is changed; but here the term "substance" is used in distinction to "accidents", as "form" is used in distinction to "matter", and not in the sense in which the term "substance" is used in science. The change which is believed to take place is not a crudely material but a "formal" change. Obviously the only method by which it can be determined whether such a spiritual change has in fact taken place is a spiritual method, and not a chemical one. In other words, the question must be decided by considering the spiritual effects of partaking of the bread and wine at Holy Communion. Again, in this case the terms "Body and Blood of Christ" are not to be thought of as being used in a scientific sense. It is not believed that the flesh and bones of Christ are present, nor that human blood containing the appropriate content of haemoglobin has appeared. What is meant is that Christ uses the bread as His Body, where "Body" is philosophically defined as "a material entity through which spirit and personality works and expresses itself"; and the wine as His Blood, where "Blood" is similarly defined as "a liquid which contains the life-principle of a living being". To argue, therefore, that the Christian doctrine of Holy Communion and the Real Presence is untrue, because it is manifestly false when the words concerned are interpreted as scientific terms, is an entirely illogical procedure. In theology, just as much as in physics, chemistry and biology, we have a perfect right to define our terms; and beliefs can only be criticized when their terms are interpreted in the way in which the Church has defined them. It is in this sense, therefore, that science and theology use different languages.

Finally, it must be recognized that the basis of religious knowledge is different from that of scientific knowledge. In science the basis of knowledge is entirely observation, experiment, induction and deduction; but in religion the basis of knowledge is primarily divine revelation, supplemented by human experience (which, under the guidance of God, is itself a form of God's revelation to us). To say that revelation cannot be the basis of religious knowledge because it is not the proper basis of scientific knowledge is a totally unjustifiable argument, all the more so because, as we have already seen, the presuppositions on which all science rests cannot themselves be justified by any scientific method but only by divine revelation. This revelation is given basically in the form of certain historical events and mighty acts of God—Creation; the Incarnation, Passion and Crucifixion, Death, Resurrection and Ascension of Christ; the experience of the Holy Spirit; and the existence of the Christian Church. These facts are either historical facts or fundamental facts of the universe, and they cannot justifiably be rejected as being mere human inventions. They represent the direct intervention of God in human history. The interpretation of these facts, on the other hand, depends upon the use of the human mind and upon human experience, though Christians believe, on the authority of Christ's promise that His Church should be led into the truth, that over the *whole* life of the *whole* Church the interpretations given to these facts by Christians will not be false; and this belief is strengthened, as has already been indicated, by the fact that these interpretations are subject to the test of centuries of thought and experience on the part of many millions of Christians in all parts of the world. St. Vincent of Lerins in his definition of Catholicity, stated that a truly Catholick Christian belief is that which has been received and believed everywhere at all times by all Christians.

Yet, although very great authority therefore attaches to those interpretations embodied in credal statements, in the last resort it is admitted, at any rate by the Church of England, that they may be mistaken, for they themselves do not constitute the divine revelation. What cannot be

false are the divine historical acts themselves. Some re-interpretation of these acts may from time to time be necessary, and has in fact been carried out at various times in the history of the Christian Church; but the acts themselves have happened once and for all, and they are the unalterable data of theology and of Christian belief.

As an example of this we may take the doctrine of the Trinity. This doctrine, or, to use the correct technical term (often misunderstood) this *dogma*, rests upon, and is the interpretation of, two sets of facts. On the one hand, as we have seen, the universe cannot be rational, intelligible or consistent unless it is the work of one single, creative Mind. Moreover, human reasoning and moral experience alike show that belief in more than one god leads to inadequate ideas of deity and degraded moral and spiritual practices. It has even been argued by Father W. Schmidt and others that the evidence of anthropology and comparative religion indicates that the earliest and most primitive form of religious belief is some form of monotheism—belief in a single, transcendent, moral God (e.g. Sun worship); and that it is the influence of man's lower nature which makes him fall away from this belief into the idea of various minor nature-deities whom he can hope to bribe to do his will or confer benefits upon him, whereas a single, transcendent, righteous God cannot be so influenced. In this and other ways it is clear that polytheism is on a lower intellectual and moral plane than monotheism, and leads to degraded religious practices. The *Christian* belief in one God rests on divine revelation, given both through the development of the spiritual experience of the Jewish nation and the progressive revelation recorded in the Old Testament, and also through the teaching of Christ Himself, Who repeated with emphasis the famous words from Deuteronomy: "Hear, O Israel, the Lord thy God is one Lord". Thus, the belief in one God rests both on divine revelation and also on human intellectual, moral and spiritual experience. We must therefore accept this fact; but on the other hand there are other facts which equally we cannot deny. They are the Christian faith in the deity of Jesus Christ, and the Christian faith in

the Holy Spirit. The former rests upon the direct revelation of Christ Himself, Who clearly and distinctly claimed to be God, not so much explicitly as implicitly, by His assumption of the right to supplement and even correct "divine teaching" recorded in the Old Testament, and to forgive sins, and Who also, as we have already mentioned, submitted this claim to the experimental proof of the Resurrection. But it rests also upon the first-hand experience and testimony of the Apostles themselves, those who knew Him most intimately and were in the best position to recognize His true character, and who proclaimed in the primitive Christian Gospel the fact of the Godhead of Christ; and on the continuous living experience, in millions of Christians, of first-hand spiritual contact with the risen and living Christ. Similarly, belief in the Holy Spirit rests upon the experience and witness of the primitive Church on the first Whit Sunday, and on innumerable subsequent occasions, of the presence among them of a divine Person, dominating and inspiring them, Whose presence could only be compared to that of Christ Himself, but was recognized as being distinct from that of Christ. Here again multitudes of Christians in subsequent centuries have testified to their first-hand experience of the presence, inspiration and power of the Holy Spirit.

Turning to the New Testament we find there in the words of Jesus Christ on the one hand references to the Father and to the Holy Spirit as Beings distinct from Himself, and on the other hand such statements as "I and the Father are one", "He that hath seen me hath seen the Father".¹ In this case, therefore, we have two sets of facts, both based upon divine revelation, and both supported by practical, experimental testimony. Yet they would appear to be contradictory, since the first set of facts compels us to believe in one God and only one God, while the second set of facts compels us to recognize three separate Persons, the Father, the Son and the Holy Spirit, as God. This situation is characteristic, as is pointed out in Appendix B, of the "dialectical principle", which may be detected also throughout the realm of nature.

¹ John X, 30, and XIV, 9.

A possible way of trying to escape from such a dilemma is to accept one view or the other as satisfactory, ignoring those facts which appear to be incompatible with it. But such an attitude is neither philosophically nor scientifically sound. We have already pointed out that an analogous situation arose in physics in regard to the nature of light, where it appeared at one time that the corpuscular and the undulatory theories of light were incompatible and the one or other must be abandoned, notwithstanding that certain facts required one view and other facts required the other. But in physics scientists continued to hold both these views about light in dialectical tension, and they were ultimately resolved by recent developments in Quantum mechanics. Similarly, in Christian thought belief in one God and belief in three divine Persons, though apparently incompatible, were held by the early Church in dialectical tension, and it was only after centuries of thought and spiritual experience that, largely through the efforts of the Cappadocian Fathers (St. Basil of Caesarea, St. Gregory Nazianzen and St. Gregory of Nyssa), a synthesis was arrived at in the doctrine of the Trinity.¹

This doctrine, as enunciated by them, depends upon the highly technical and philosophical use of two Greek terms, *οὐσία* and *ὑπόστασις* translated in English as "substance", and "person"; but the meaning of the words "substance" and "person" as here used is very strictly and technically defined, and bears little relation to the sense in which these words are used in other "languages". The content of these terms was defined against the background of the Hellenic philosophy current in Eastern Europe in the 3rd century A.D. It may well be that it requires restatement in terms of the philosophy and psychology of the 20th century, and several such restatements have in fact been made.² But although in this way the presentation of the dogma of the Trinity may require the redefinition of the *content* of its terms

¹ It is an interesting and enlightening exercise to study the historical development of the doctrine of the Trinity and its phraseology in the 3rd and 4th centuries, culminating in the Cappadocian Fathers.

² E.g. in Leonard Hodgson's *The Doctrine of the Trinity* (Nisbet, 1948).

against different philosophical backgrounds at various times, the fundamental facts or dogma of which the doctrine is an interpretation remain unchanged. The facts are there and compel us to recognize the existence of three Persons in one God. That is the concrete revelation, and any interpretation must always be based upon, and be true to, these facts.

It should be apparent from the examples given and from what has been said above that there is a very close similarity between doctrinal or theological interpretations and scientific theories; but the similarity is between scientific theories and doctrinal interpretations and not between scientific theories and fundamental dogmas. The fundamental dogmas are factual. They are either facts directly and divinely revealed, or historical divine actions. They are the material upon which any doctrinal interpretation must be based, and therefore they are analogous to the experimental or observed facts on which any scientific theory must be based. Just as a scientific theory commands general respect and acceptance if it provides a satisfactory correlation and interpretation of all the relevant data and facts, so a theological doctrine commands authority and respect if it, in its sphere, provides a similar satisfactory interpretation and correlation of the data and facts. Again, a scientific theory which is supported by the independent observation and testimony of large numbers of scientists over a considerable period naturally commands a higher degree of respect than one based upon few observations, which there has not yet been time thoroughly to test. In the same way the acceptance of a new theological interpretation, put forward in the 20th century by a small body of Christians, would be subject to a proper degree of doubt, whereas an interpretation which has been held over very long periods and tested and examined by vast numbers of Christians very properly commands a much higher degree of acceptance. It is for this reason, as has already been stated, that the Apostles' and Nicene Creeds above all are regarded as supremely authoritative theological statements in the Christian Church. Even here, however, it is not the precise wording of the Creeds that matters, but the acceptance of the facts which they record. Belief in the precise *phraseology*, e.g.

of the Chalcedonian definition of the Person of Christ, is in no way essential to spiritual health and well-being; but on the other hand, as St. Paul points out, the person who finds himself unable to accept the fundamental *fact* of the Resurrection of Jesus Christ has rejected one of the essential factual cornerstones on which the whole Christian belief rests. The Resurrection is not a matter of doctrinal statement but of actual historical fact, which, as we have already shown, must be considered in the light of the historical evidence for it. A great part of the hesitation that scientists feel in accepting the Creeds arises from confusion on this point. They imagine that they are being asked to accept a particular interpretation of a particular phraseology, whereas actually they are being asked to accept the fact of which this phraseology, unimportant perhaps in itself, is an attempted expression. Thus, the idea that in the Christian Creeds and other doctrinal statements they are being asked to accept statements on arbitrary authority, similar to that upon which mediaeval physicians were asked to accept the statements of Galen and Hippocrates, is quite fallacious. The Christian Creeds are not to be accepted on the human authority of the Council of Nicaea or any other council, but on the divine authority of the data which they record. In other words, their authority rests not upon their being dicta of one human being or an assembly of human beings, but on their being a statement of fact, which can be examined and, in some degree, experimentally proved in spiritual experience by all Christians for themselves. The scientist can therefore adhere to such credal statements without betraying either his loyalty to truth and fact or his rejection of arbitrary human authority.

What has been said above refers essentially to the generally accepted Catholick creeds. The doctrinal statements of particular Churches, e.g. the Thirty Nine Articles of the Church of England or the Westminster Confession of the Church of Scotland, obviously carry far less authority than these creeds. They have never been generally accepted by all Christians everywhere at all times. They are much more modern formulations of doctrine and therefore have not been

subject to anything like so long or thorough an examination or test as the great creeds, and they are far more influenced by the temper and thought of the time in which they were composed. They are, moreover, very much more detailed than the great creeds. Such denominational statements are therefore much more in need of revision, re-interpretation, and restatement from time to time, than the great cardinal creeds. It is, however, a curious fact that whenever such restatement is attempted, the attempt, which almost always emanates from the clergy and from trained theologians, is defeated by the ignorance, prejudice and apathy of the laity. It may be mentioned, however, that whereas a clergyman of the Church of England is expected to express his belief in and acceptance of the whole of the two great creeds, he is only required to give a general assent to the doctrine contained in the Thirty Nine Articles; and since, as a whole, this doctrine is based upon the Bible and the creeds, he need feel no hesitation in giving this general assent, though he would no doubt feel quite unable to register precise agreement with all the details of the document.

We have already, in reference to the creeds and to the Thirty Nine Articles, mentioned the Bible as a vehicle of divine revelation. Here again, however, it must be made clear that we are not adhering to any idea of the literal inspiration and truth of every word in the Bible. It is now recognized by all scholars that in the Old Testament we have the record of God's progressive revelation of Himself to the Hebrew and Jewish people; and that there are in the Old Testament various levels or stages of religious belief, from primitive superstition to the highest moral and spiritual ideas which had ever been reached by men before the coming of Christ. It must be admitted that the earliest portions of the historical books, such as Genesis, Exodus and Judges, contain much folk-lore and primitive tradition. It would be absurd to treat as being of equal spiritual, moral and intellectual value the ideas of God contained in the story of Zipporah (Exodus IV, 24-26) or Samson, and those proclaimed by the prophets Hosea and Jeremiah and the author of Isaiah XL-LV. God does not teach men by using human beings

as typewriters or loudspeakers, speaking through them or treating them as machines or slaves without regard to their personal mind, but by their gradual and progressive enlightenment through the experience of their lives and the intellectual activity of their reason. When, therefore, we say that we look to the Bible as a source of religious truth and doctrine, we mean that we look to the teaching of the Bible *as a whole, sensibly and intelligently studied*, rather than to the unintelligent manipulation of individual tests; and this is equally true in regard to the New Testament. It is obvious that there are discrepancies in detail between the records even of the first three Gospels and to a greater extent between these three and the fourth Gospel; but the discrepancies are differences of personal interest or of emphasis, observation or wording rather than fundamental differences of teaching and fact. If we treat the Gospels as a whole instead of studying individual texts in isolation, we have no difficulty in discerning the fundamentals both of the revelation of God in Jesus Christ and of the religious and moral teaching of Jesus; and it is these fundamental facts and this essential body of teaching which must form the basis of Christian belief and Christian creeds rather than any particular sayings or texts. This is the answer to the objections rightly raised by Sir William Bragg in his lecture on "Science and Faith" against the old-fashioned view of the literal truth of every part of the whole Bible. It is perhaps one of the greatest benefits of biblical study in the last hundred years that we can now regard the books of the Bible from a historical point of view. Moreover, the insistence of Karl Barth and modern Continental Protestants reminds us of the vital importance of the Bible (treated in this intelligent way) as the basis of God's revelation, the living Word of God, and therefore counteracts the earlier results of liberal criticism in decrying the importance of the Bible simply on the ground that the idea of literal verbal inspiration was untenable. In this also we may see another example of the dialectical principle, and claim that the general attitude of the Church of England represents a proper synthesis of higher criticism and Barthian theology.

It has recently been pointed out by Austin Farrer¹ that divine revelation has come to men both in the form of historical events and also in the form of archetypal symbols. There are certain great fundamental ideas which have acted as centres of crystallization or concretion round which the religious ideas and experience of men have gathered and which have acquired an ever-increasing richness of religious content. As Farrer says, "Divine truth is supernaturally communicated to men in an act of inspired thinking which falls into the shape of certain images." Among such images are the Kingdom of God and God's enthroned majesty, the Son of Man, the image of Israel, the human family of God, and the suffering Servant. Farrer writes: "These tremendous images, and others like them, are not the whole of Christ's teaching, but they set forth the supernatural mystery which is the heart of the teaching. Without them, the teaching would not be supernatural revelation, but instruction in piety and morals. It is because the spiritual instruction is related to the great images, that it becomes revealed truth. . . . The great images interpreted the events of Christ's ministry, death and resurrection, and the events interpreted the images; the interplay of the two is revelation. Certainly the events without the images would be no revelation at all, and the images without the events would remain shadows on the clouds."²

It is obviously true that the facts of the death of Christ and even of His Resurrection obtain their terrific significance from the fact that He Himself was Son of God. The death under similar circumstances of an ordinary human being would be no more than an act of heroism and self-sacrifice, the resurrection of an ordinary human being no more than a strange and unusual event. On the other hand, the great images or archetypes of the Bible would be in themselves no more than abstract poetic ideas if they were not related to concrete historical facts. It is significant that the very word which Farrer uses, "archetype",³ is precisely that used by Jung in

¹ Austin Farrer, *The Glass of Vision* (Dacre Press, 1948).

² *Ibid.* pp. 42, 43.

³ *Ibid.* e.g. p. 100.

his philosophical system for the great common psychological symbols of the collective unconscious of humanity; and we may well believe that here, as elsewhere, God has used, and indeed created, the normal processes of the human mind as the vehicle of His own divine self-revelation.

Thus, it is clear that our religious knowledge rests upon a foundation of divine revelation—a source of knowledge beyond the scope or sphere of unaided human understanding and intelligence—together with historical facts, which are open to normal historical study, and personal experience and experimental testimony, open to examination by human reason. There is nothing here that is contrary to or incompatible with the ideals and principles of science. If it be objected that science knows nothing of revelation as a source of knowledge, the answer is that if men had not received by divine revelation their faith in one God and in the order, consistency and intelligibility of the universe and the reliability of human reason, they would never have begun to do science. (See Part I.)

But religion has never claimed that men have received or could comprehend a revelation of the whole nature of God or the complete majesty of His Being, much less express it in human language. There is a vast element of the mysterious, the ineffable, the unknown in God, which can never be grasped by the human mind. Similarly, it is increasingly recognized, particularly in the sphere of physics, that there are severe limitations to the bounds of the human understanding and many things which, by their very nature, must always remain unknown and incomprehensible to us. It is, as has already been stated, a necessary working axiom of science that every fact and aspect of natural existence is amenable to study by the scientific method, and that it is the duty of the scientist to pursue his method without hesitation in whatever sphere he is studying; but it is equally clear that this is a working axiom and not a true fact, and that it is actually contradicted by many of the phenomena already known to science. The element of mystery which must always remain in theology is akin to the element of mystery which must always remain in science. The Existentialists

have pointed out that life is always more than can be described in any language, and that the ultimate fact is personal experience which enshrines a mystery. The mystery in religion can only be experienced in worship.

"Religion is the vision of something which stands beyond, behind, and within, the passing flux of immediate things; something which is real, and yet waiting to be realized; something which is a remote possibility, and yet the greatest of present facts; something that gives meaning to all that passes, and yet eludes apprehension; something whose possession is the final good, and yet is beyond all reach; something which is the ultimate ideal, and the hopeless quest. The immediate reaction of human nature to the religious vision is worship. . . . The vision claims nothing but worship; and worship is a surrender to the claim for assimilation, urged with the motive force of mutual love. . . . The power of God is the worship He inspires. That religion is strong which in its ritual and its modes of thought evokes an apprehension of the commanding vision." Thus writes A. N. Whitehead.¹

But although much must remain beyond our apprehension and reach, a mystery, yet much is also revealed; and it is revealed not only in God's "mighty acts", in His divine Word, in human experience, but also in His work in Nature which Science studies. Science alone cannot show us God; but it can reveal His creative activity and something of His character as Divine Artist; and it is the study of the record and revelation which He has given to us in the natural world.

Recently Professor C. A. Coulson has said: "When we read a play, we can usually see something of the author in it: when we study the theatre, we may reasonably hope to see something of the Great Designer. God must, somehow, be revealed in His Universe, if it is His at all: it is for man to explore Him in it. And for us reflecting on the Nature of the physical world, it is the scientist who is the explorer. It ought to be part of the job of the scientist to show us what he sees of the nature of God. For the Heavens, and not only

¹ A. N. Whitehead, *Science and the Modern World*, pp. 238, 239 (Cambridge University Press, 1925).

the Bible, declare the glory of God. . . . But the scientist only sees his discoveries as revealing the work of God when he is prepared for something of that kind. The partial picture obtained by a scientist acquires religious significance only when looked at in the right way. . . . Our science will be seen in its proper perspective only from beyond science; our religion, too, will become fully alive for us only when the splendour of the world revealed by science is bodied forth in awe, and in worship and understanding.”¹

I cannot conclude this book better than by quoting some words I heard spoken over thirty years ago by Sir William Bragg at the end of a course of lectures on “Sound” at the Royal Institution: “Some people say that religion and science are opposed; so they are, but only in the same sense as that in which my thumb and forefinger are opposed—and between the two one can grasp everything.”

¹ Professor C. A. Coulson, F.R.S., *God, the Creator* (C.E.Y.C., 1951).

APPENDICES

MODERN PHILOSOPHIES ARISING FROM SCIENCE

It may be of interest to refer briefly to two philosophies which have arisen out of modern science and make a specific claim to be "scientific philosophies", and also one philosophy which has been provoked by modern science by way of reaction. The two philosophies of the first type which we shall consider are Logical Positivism and Dialectical Materialism, while the philosophy of the second type is Existentialism. All these three philosophies may not unfairly be described as anti-rational philosophies. The first two give a limited place to human reason, but by their very essence deny the validity of conclusions arrived at by any form of metaphysical reasoning; while the third is an attempt to propound a philosophy which deprecates any abstract or objective intellectual or rational consideration of a question. Taken with the tendencies which we have already mentioned, in modern mechanistic physiology and behaviourism, in psychology, especially psycho-analysis, and in certain forms of scientific philosophy claiming to be based upon modern subatomic physics, they constitute a very serious threat to the belief in the scope of human reason or the ability of the human mind to reach true and reliable conclusions. It is curious that, while the whole basis of science rests, as we have seen, upon the presupposition that the universe is rational and that human reason can be trusted to distinguish between truth and falsehood, these so-called scientific philosophies tend to reject these very presuppositions.

APPENDIX A

LOGICAL POSITIVISM

THE word "Positivism" is no new thing. It was coined by Auguste Comte in the 19th century; and the essence of all forms of Positivism is that they will not accept anything which cannot be proved by empirical observation based upon the senses. But whereas the old Positivism was based upon the idea that 19th-century science was the one method by which human beings could acquire certain knowledge, Logical Positivism arose not out of physical science so much as out of mathematics. Early in the present century Bertrand Russell and A. N. Whitehead carried out an examination of the foundations of mathematics, and claimed to have succeeded in showing that the whole of arithmetic could be deduced from the principles of logic. Moreover, they maintained that the propositions of arithmetic and logic could be expressed in a set of symbols, so that it was not possible to say where logic ended and arithmetic began. Between 1910 and 1913 these authors published their famous book, *Principia Mathematica*, in which they set out a number of symbolically expressed deductions obtained from a strictly limited collection of primitive ideas and primitive propositions. Unfortunately, the account of mathematics there given could not be deduced without the introduction of an axiom, called the Axiom of Reducibility. This was not to be deduced from the premises which underlay *Principia Mathematica*, and therefore its truth could not be demonstrated. It was in the attempt to remedy this defect that Russell's pupil, Ludwig Wittgenstein, used a new method. Whereas Russell gave his attention to the ideas to which the symbols pointed, Wittgenstein developed the *analysis of language*, for symbols are in themselves a form of language, even if an artificial or arbitrary one, and a language which can be used with great exactitude. Wittgenstein expounded his views in 1922 in the very complex work called *Tractatus Logico-Philosophicus*.¹

¹ Ludwig Wittgenstein, *Tractatus Logico-Philosophicus* (Kegan, Paul, 1922).

Shortly before this G. E. Moore, C. D. Broad and Susan Stebbing at Cambridge had also been developing analytical philosophy and giving their attention to the study of symbolic logic, and they also were primarily concerned with the language in which ideas were expressed and the analysis of this language.¹ Wittgenstein's ideas were adopted and developed in 1930 and thereafter by a number of philosophers in Vienna and in Berlin. The Vienna group, including particularly Moritz Schlick, Rudolf Carnap and K. Gödel, became the most characteristic exponents of a new philosophy which they called Logical Positivism; while Hans Reichenbach at Berlin was working on similar lines. These writers started from Wittgenstein's point of view, that the first and essential thing was to analyse the structure of the language which is used in philosophy or logic. They combined this with the positivist idea that metaphysics and abstract rational speculation is pointless; but their standpoint led them to declare that metaphysics is *meaningless* because its propositions arise from a misuse of language. Language can have only two functions: one is to give expression to what the Logical Positivists call "empirical hypotheses", and the other is to state formal rules. The formal rules simply define the way in which symbols are used, i.e. the use of symbols in a science and the use of words in a language. Statements of this type are described as "tautological", that is to say, they add nothing to our knowledge of the external world, but simply set out the rules according to which the language or set of symbols is to be used.

The first type of statements—"empirical hypotheses"—are what would usually be called statements of fact; but the Logical Positivist at once asserts that not all apparent statements of fact are empirical hypotheses. When we are confronted with a sentence which is an ostensible statement of fact, there are two questions which we may ask about it. We may ask "Is it true?" or we may ask, "What does it mean?" The Logical Positivist argues that we rarely stop to ask the second question and consequently we attempt to

¹ An interesting example of the application of linguistic analysis to the examination of the philosophical propositions in the classical rational arguments for the existence of God, may be found in John Laird's Gifford Lectures—*Theism and Cosmology* and *Mind and Deity* (Allen & Unwin, 1940 and 1941), and, in another field, in a paper on "The present relations of Science and Religion", by Professor C. D. Broad (*Philosophy*, Vol. XIV, No. 54, p. 131, April, 1939).

answer the first question with reference to statements which are really meaningless. Such statements cannot be either true or false, because they express nothing, being a misuse of language.

In other words, a statement that is grammatically correct is not therefore significant; and we must begin by asking of every apparent statement of fact, "Is it significant or meaningful?" How are we to decide this? The answer of the Logical Positivist is that a statement is meaningful, and can properly be called an empirical hypothesis, if, and only if, it can *in principle* be verified by human experience. In other words, any statement which cannot, at any rate in theory, be tested by empirical observation, i.e. by experiment, observation or human experience, cannot be regarded as a meaningful or significant statement. Now, statements of a metaphysical character cannot be so tested. A. J. Ayer, who is the leading English exponent of Logical Positivism, in his early book, *Language, Truth and Logic*,¹ quotes as an example of a metaphysical statement which is incapable of empirical verification, and therefore meaningless, the following words from F. H. Bradley's book, *Appearance and Reality*: "The absolute enters into, but is itself incapable of, evolution and progress." This, he says, is not even in principle *verifiable*, for "one cannot conceive of an observation which would enable one to determine whether the absolute did or did not enter into evolution and progress."

Divergences arose among Logical Positivists as to the exact meaning of the word "verifiable". Some of them held that a proposition can only be said to be verifiable if its truth can be *conclusively established* in experience. But others held that it is verifiable if it is possible for experience to render it *probable*. The tendency recently has been to accept the weaker definition of verifiability. It is not only the propositions of metaphysics which are held by the Logical Positivists to be meaningless or "nonsense". They hold also that theological statements, ethical statements and many other types of statements are similarly meaningless, since it is the function of language only to give expression to such things as may be empirically verified, and, they maintain, ethical and theological statements are not of this character.

As Ayer pointed out with great jubilation in his book, *Language, Truth and Logic*, quoted above, almost all the problems which in the past have engaged the main attention

¹ A. J. Ayer, *Language, Truth and Logic* (Gollancz, 1936).

of philosophers are not really problems at all, but rather pseudo-questions which would never have arisen if the philosophers concerned had taken the trouble to consider the use of language. "The function of the philosopher is not to devise speculative theories which require to be validated in experience, but to elicit the consequences of our linguistic usages."¹ The essential function of language, according to the Logical Positivists, is to provide a set of symbols in which the conclusions of science may be stated and the ideas of one science correlated with those of another. Carnap says that the "philosophy of science is the syntactical analysis of the language of that science"; and the Vienna circle held that of all the various languages of the different sciences the physical, or that in which we speak about physical things in everyday life or in physics, is of the greatest importance. Hence, they came to hold that this physical language is the basic language of all science and the universal language comprehending the contents of all other scientific languages.

Finally, if every sentence can be translated into this physical language, then this language is an all-embracing language, a universal language of science. From this they reached the thesis of "the unity of science".

It will be observed that the philosophy of Logical Positivism raises very serious problems for the Christian religion, as well as for other forms of philosophy. Logical Positivism has dominated philosophical discussion, at any rate in England, for the last twenty years, and has led to an ever-increasing consideration of the structure and function of language and the principle of verifiability, as well as of the question of perception, which has been discussed by Ayer in his latest book, *The Foundations of Empirical Knowledge*. No Christian can accept the dogmatic assertion that a statement cannot be true or "meaningful" unless it is directly empirically verifiable in human experience.² Many of the theological statements in the Christian doctrine of God are not so verifiable and by their very nature could not be;

¹ *Op. cit.* p. 209.

² Ayer points out that "if the assertion that there is a god is nonsensical, then the atheist's assertion that there is no god is equally nonsensical." (*op. cit.*, p. 175). Subsequently (pp. 177, 178) he says, "there is no logical ground for antagonism between religion and natural science. As far as the question of truth or falsehood is concerned, there is no opposition between the natural scientist and the theist who believes in a transcendent God. For since the religious utterances of the theist are not genuine propositions at all, they cannot stand in any logical relation to the propositions of science."

but a Christian will not recognize them as therefore meaningless. They may not be statements in a language meaningful to science; but they are real statements in the language of other forms of knowledge and experience. On the other hand we may consider that there are two positive contributions made by Logical Positivism to Christian thought. The first is its emphasis on the importance of practical experience. While it would be quite untrue to say that all the doctrines of Christianity are derived from human experience, since in fact the greatest at least of them are given by divine revelation in history rather than by human experience alone, yet, as we have already seen,¹ it is true that the validity of creeds and other doctrinal statements has traditionally been tested and vindicated in the corporate experience of the Christian Church, and it is surely in this sense that our Lord promised that the Holy Spirit would guide His Church into all truth. Moreover, it is an unquestionable fact that no one can understand the Christian religion or be convinced of its truth by the intellect alone in abstraction from experience. Christian faith rests upon a combination of the intellect, the spirit and the will, and conviction can only come through practical experience in prayer, worship and life. It is in a sense true that intellectual affirmations, entirely divorced from life and activity, are meaningless. This emphasis on the place and importance of both personal and corporate *experience* in the thought of the Church and the life of the Church, while it is no new thing, has often been ignored or rejected, in favour either of arid and speculative intellectualism or uncontrolled individualism or emotionalism, and the Logical Positivists, in reminding us of the importance of empirical verification, may render a real service to Christian theology in the genuine spirit of science.

It is true that some parts of religious experience can never be expressed in any language, as the great mystics so clearly recognized. They were constantly insisting that it was impossible for them to express in human language the mystical experiences which they had undergone in contemplation. In fact, when Wittgenstein wrote in *Tractatus Logico-Philosophicus* as follows: "Whereof one cannot speak, thereof one must be silent," and: "there is, indeed, the inexpressible. This shows itself; it is the mystical."; he was in fact echoing the typical thought of Christian mystics. Yet although any

¹ See Part III, Chapter II.

theological expression is subject to this very severe limitation, this does not mean that no discussion at all can take place concerning theological truths or simple spiritual experience.

Secondly, by their insistence on the importance of examining the use and limitations of language, the Logical Positivists have reminded us that it is possible to press the language of theological definitions and doctrinal statements or, for the matter of that, of scientific statements, too far out of their proper sphere of relevance. We must remember that Logical Positivism arose out of mathematics and concerned itself with science, primarily with physical science. For this reason the conclusions reached by the Logical Positivists would seem valid only within the sphere from which they began. But if we use scientific terms for non-scientific purposes they do in truth become meaningless or nonsensical. For this reason an attempt to express Christian doctrine in the language of science would indeed be unsuccessful and even meaningless. The truth is that each branch of knowledge should have a language or set of symbols appropriate to itself. These symbols are meaningful within the sphere and branch of knowledge for which they are intended, and meaningless when applied outside that sphere. Thus, scientific facts and principles should be expressed in scientific language and not in theological language. On the other hand theological doctrines and principles must be expressed in theological language rather than in scientific language. Confusion arises if we import scientific terms into theological discussion or try to understand theological terms as if they were part of the language of science. Similarly, history requires a language of its own which is different from the language of science. Trouble arises from the fact that identical words or symbols may be used in different languages; but in every case their meaning and relevance must be interpreted in terms of the particular language and branch of knowledge then under discussion.

The Logical Positivists can very rightly point out that both in metaphysics and in theology much confusion of thought has resulted from the attempt to draw out a meaning from words in theological discussion which those words bear only in reference to some other form of knowledge than theology. Thus, a great many emotional and sentimental statements about the character and activity of God have been deduced from an attempt to interpret the words used about God in the Bible or in theology as if they were being

used about some other person or subject. Many of the worst excesses of Victorian hymnology provide blatant examples of this.

In the discussion of the being, character and activity of God it is vitally important to remember the principle of analogy so clearly enunciated by St. Thomas Aquinas. St. Thomas pointed out that analogy can be of two types, analogy of proportionality and analogy of attribution. Analogy of attribution is a direct analogy, as when we say that something is like something else. Analogy of proportionality is more truly analogy, since in this case we say that the relationship of one object to another in one sphere or level of existence is analogous to the relationship of one object to another in a second sphere. Expressed mathematically, that is to say, analogy of attribution is " $a:b$ ", while analogy of proportionality is of the form " $a:b :: c:d$ ". Thus, we can never say that we are speaking precisely or literally of the activity or character of God when we are employing human terms. It is wrong to use of God *without any qualification* words expressing human emotions, such as anger or pleasure or sorrow. The most we can possibly be justified in saying is that on the divine level there is something analogous to what on the human level is anger or pleasure or sorrow. What that is in itself it is impossible for man to know. The most we can do is to speak of God indirectly, in terms of analogy. If once this fact is recognized and the way in which language or symbols are used in theology is understood, a great deal of bad theology as well as a great deal of the objection of Logical Positivists to theology should disappear.

Again, as Dorothy Sayers has admirably pointed out, science has its own precise set of technical terms which are unintelligible in any context other than that of science. If we attempt to understand the language of physics as if it were the language of everyday conversation, we are, as many physicists have pointed out, led off into entirely erroneous ideas. Similarly, if we attempt to interpret a technical term of theology, e.g. the Wrath of God, as if the word "Wrath" were used in the same sense as it is used in ordinary conversation, we shall reach an entirely wrong understanding of what the term means. There is very little doubt that considerable study should be devoted to the precise character and definition of the language of theology, and the Logical

Positivists have rendered a true service by pointing out the importance of precise definition and of the correct use and limitation of language.

On the other hand, when they say that the sole function of language is either to make empirically verifiable statements of a scientific character or to define the way in which the symbols of that particular language are to be used, the Logical Positivists are making an entirely arbitrary limitation, and confining the scope of philosophy solely to that of the philosophy of science. If Logical Positivism seeks to become a wider form of philosophy, it must recognize other forms of verification and other types of language. It is quite true that both Bertrand Russell in his work on the hierarchy of language, and the Logical Positivists themselves in their conception of the different languages of different sciences, have recognized the existence of distinct languages.¹ But they have deliberately stopped short at the boundaries of science. Had they been willing to widen their point of view, they might have rendered a real service to the whole field of human life and thought. As it is, their effect upon the modern schools of philosophy in the universities has in some ways been deplorable. As R. G. Collingwood pointed out in his *Autobiography*, in the old days a student of philosophy was asked to consider the fundamental problems of the world and the meaning of existence, the principles of conduct and, in the true sense, the philosophy of life. Nowadays, on the other hand, he is left with the sense that philosophy is no more than a critical analysis of linguistic terms and a discussion within a very limited sphere of certain points, such as perception and verifiability. The reader of such a book as Ayer's *Language, Truth and Logic*, is left with the impression that very little knowledge or conviction is to be obtained by the method of modern philosophy and none whatever by any alternative method. The result of this is to lead to a sense of hopelessness and frustration, since no ethical principles or standards have any reality and it is impossible to discover any purpose or meaning in life. The aridity of such a situation is evident. Modern academic philosophy has become negative and destructive, rather than positive and constructive as it used to be in most former ages. The consequence has been that students have tended, both in

¹ See R. Carnap, *Logical Syntax of Language* (Kegan Paul, 1936); also Bertrand Russell, *An Inquiry into Meaning and Truth* (Allen & Unwin, 1940).

England and abroad, to seek refuge either in an extremely rigid and self-confident practical philosophy such as Marxism, or in a primarily emotional, intuitive philosophy of action such as Existentialism. Thus, while Christians may benefit from the constructive contribution made by Logical Positivism on the two lines indicated above, it is essential that they should point out the limitations and barrenness of Logical Positivism and the fact that in the end it is self-stultifying and self-contradictory; for if it is true that the language of philosophy will not allow any of metaphysical statement whatever, then the very statements upon which Logical Positivism itself is based, being of a metaphysical nature, are meaningless, and thus, like other philosophies of this "solipsist" type, Logical Positivism destroys its own basis and contradicts itself. A purely critical, analytical and destructive philosophy can never by itself be satisfactory, however valuable it may be within a limited sphere. As St. Thomas Aquinas so clearly recognized, philosophy needs to be embraced, inspired, enlightened and glorified by Christian faith and theology if it is to escape such a fate.

APPENDIX B

DIALECTICAL MATERIALISM

THE second important philosophy which has arisen partly out of the ideas of science within the last hundred years or so is Dialectical Materialism. This is the official philosophy of the Communist Party and was originally stated by Karl Marx and Frederik Engels between 1847 and 1880. It may be said to have three foundations: first, a reaction against certain of the ideas of Hegel, whose philosophy was dominant in the early part of the 19th century; second, Marx's particular economic interpretation of history; and third, scientific ideas derived mainly from the evolutionary theories of Lamarck and Darwin. We are not here concerned with the economic ideas of Communism, except in so far as they touch upon the materialistic side of Dialectical Materialism.

As its name suggests, Dialectical Materialism combines two elements, "dialectic" and materialism. The word "dialectic" is descriptive of a particular type of argument or process of thought which stretches right back to the time of the Greek philosopher, Plato. If we study the dialogues of Plato, we find that the underlying method of them is that one of the two speakers puts forward a certain point and the other raises an objection to it, or propounds a contrary point. The first speaker then endeavours to reply to this point by further development of the thought which, if possible, combines and supersedes both the original idea and the contrary idea. It is the conflict of proposition and counter-proposition which brings to the argument its movement and development, and this method of argument was used by philosophers from the time of Plato to the time of Bishop Berkeley in the 18th century. The principle of proceeding by means of proposition, counter-proposition and the combination of both, or, to use the technical terms, thesis (the original proposition), antithesis (the contrary proposition) and synthesis (the combination of both which marks an advance upon them), is called the dialectical process.

Hegel applied this method to a much wider sphere of philosophy than ordinary argument and discussion. His philosophy was an intensely rationalistic philosophy, in that he said, "Whatever is rational is real and whatever is real is rational", and it bears strong resemblances to many of the ideas of Plato. He held that "The Absolute" includes not only all thought but all experience; so history is a part of it and will exhibit the same dialectical interconnection which is the property of forms of thought and the progress of thought. Therefore Hegel deduced that the dialectical process characterizes and governs not only thought but also historical events in the temporal order; and the clue to the development of history is to be found in the dialectical process. Thus to Hegel the dialectical development of thought expresses itself in history and we can arrive at an understanding of the development of ideas in history by observing this dialectical process. Hegel gave a very important place in his philosophy to history, but he was interested in the study of past history for the light which it shed upon the development of thought in the Absolute, and upon the interpretation of life and the world.

Marx reacted against this point of view and he himself said that he sought to "turn Hegel upside down". Whereas Hegel held that the function of philosophy was to *interpret* the world, Marx held that the function of philosophy was to *change* the world. Again, Marx completely rejected the whole of Hegel's metaphysical scheme and his conception of the Absolute; and instead of regarding history as of interest because of the light which it shed upon the "Ideas", he was interested in history for the light it shed upon the economic processes which controlled it. Although Marx thus sought to replace the "idealistic" philosophy of Hegel by a severely "realistic" or materialistic philosophy, he yet retained as the centre of his system the dialectical process; but whereas Hegel had considered the dialectical process in relation primarily to ideas, Marx considered the dialectical process in relation primarily to history and the natural world. He believed that the development of history is due to the conflict of opposing economic interests and classes. Every tendency which develops provokes an opposite counteracting tendency, and from the conflict between the two results historical progress and development through the synthesizing of the thesis and antithesis. The dialectic of the Class Struggle in history

is expressed as follows by Marx and Engels in *The Communist Manifesto* of 1848:

"The history of all hitherto existing society is the history of class struggles."

"Free man and slave, patrician and plebeian, lord and serf, guildmaster and journeyman, in a word, oppressor and oppressed, stood in constant opposition to one another, carrying on an uninterrupted, now hidden, now open fight, a fight that each time ended either in a revolutionary reconstruction of society at large, or in the ruin of the contending classes."

The economic interests of the privileged constitute the thesis, the economic interests of the dispossessed the antithesis, the new economy to which the struggle gives place, the synthesis. Thus, for example, the conflict inherent in feudal society between landowner and serf inevitably produced as its synthesis the emergence of the commercial society of the Reformation period, with its new tension between master and journeyman.

Conflict is produced by an alteration in the conditions of production. Thus, "any change in the condition of production would necessarily alter the forces and ultimately the relations of production. These relations of production correspond to a definite stage of production. On these depend the laws of organization of the state. At certain stages the means of production come into conflict with the existing relations of production. These latter may even become fetters. Then comes the social revolution." The ancient, feudal and bourgeois methods of production all involved inherent social conflicts or antagonisms, and therefore each stage has disintegrated and given way to the next. Only in "the classless society" will such antagonisms cease to exist.

The dialectical principle which was applied by Marx to history and economics was applied, more particularly by Engels, to the sphere of nature. Using the evidence of the facts of evolution pointed out by Darwin and others, Engels had no difficulty in showing that the whole of nature is permeated by the dialectical principle. There is no doubt that in this he was right. It has been pointed out by Communist philosophers¹ that the very basis of matter is dialectical, since the existence of the atom depends upon the tension

¹ For an exposition of the dialectical principle in modern science, see J. B. S. Haldane, *The Marxist Philosophy and the Sciences* (Allen & Unwin, 1938).

between positively and negatively charged particles. The dialectical tension or conflict between these opposing particles is synthesized in the atom. In the biological world the dialectical principle is seen in the crucial facts of the struggle for existence. We have already stated that the struggle between various organisms for the means of existence, and the elimination of the unfit, is an evident and vital characteristic of the living world. Such a conflict and tension is thoroughly dialectical, and, as we have seen, it is precisely the existence of this conflict and tension which produces movement and development in the organic world. Were there no tension or conflict, the organic world would be static and dead. Dialectical Materialism has rendered a real service by drawing attention to this fact and by insisting that there is such a thing as creative strife.

Christianity has no cause to quarrel with the dialectical principle in Dialectical Materialism. It is itself a thoroughly dialectical religion both in its thought and in its practice. Most of the essential doctrines of Christian theology are dialectical in character. Thus, as we have already noted,¹ the doctrine of the Trinity represents a synthesis between the idea of the Unity of God and the existence of one God only, on the one side, and the revelation of the Three Persons, Father, Son and Holy Spirit, on the other side.

Similarly, the Christian doctrine of the nature of the Incarnate Christ as defined at the Council of Chalcedon represents a synthesis of the evidence of the presence of two natures, human and divine, in Christ, and of the unity of the Person of Christ. Here again, it would have been easy enough to seek the solution of this apparent contradiction, as certain heretics tried to do, by denying the reality either of the human nature or of the divine nature of Christ; but the dialectical and true solution was to hold both in tension until a synthesis was arrived at in the Chalcedonian doctrine of the Incarnation.

We may say that the dialectical principle insists that men never know the whole truth in one single, completely satisfying idea. Truth, for human beings, is experienced in the form of two or more conflicting ideas which have to be held in tension, and out of which may ultimately come the synthesis which combines and transcends both. This applies in the scientific sphere as much as in the theological, and in

¹ See Part III, chapter II.

physics an excellent example was mentioned earlier in regard to the question of the nature of light.

But it is not only in the sphere of thought that the Christian religion is characteristically dialectical. It has its dialectic in action also, for Christianity is essentially a religion of struggle and effort, in contradistinction to the Eastern religions whose essence is an escape from effort or conflict. Christ Himself preached conflict and struggle: "I am come to bring not peace but a sword"; and Christians have always recognized the need for opposing and fighting social evils. Anyone who reads the notes and examples given in Karl Marx's *Das Kapital* will recognize that Marx had a real love of social righteousness and a genuine moral indignation against the appalling social injustices of the 19th century, resulting mainly from the Industrial Revolution. In this his attitude was characteristically biblical. He was following in the steps of the Old Testament prophets such as Amos, Micah and Isaiah, and was entirely in harmony with the militant spirit of Christ in His attacks on the hypocrisies and injustices of His own day. It is perhaps worth noting that Karl Marx was himself a Jew, and his philosophy showed this fact in three distinct ways. First, like all the great Jewish teachers of the Old Testament, he was filled with the ideal of social justice. Secondly, like all Jews, he took matter seriously, just as Christianity also does. Thirdly, he shared that apocalyptic view which dominates Old Testament writers such as Daniel and Zechariah, looking forward to the coming of the Kingdom of God upon earth. Marx, being, largely owing to an accident of history, an atheist, did not use the phrase "the Kingdom of God". Instead he spoke of "The classless society"; but the characteristics of the classless society of Marx have many points in common with those of the Kingdom of God looked forward to by the Jewish Apocalyptists. Thus, there is no conflict between Christianity and Communism in regard to the dialectical element in Communist philosophy. The late Archbishop William Temple once said that Christianity possesses its own dialectic just as much as Communism does, but it is a much more thorough and more far-reaching dialectic.

The other side of Communistic philosophy is materialism, but it is a materialism interpreted in dialectical terms, and therefore bears little resemblance to the gross materialism of the 19th-century scientific materialists. These latter mate-

rialists attempted to explain every phenomenon of life, thought and feeling purely in terms of chemistry and physics, in the most materialistic manner possible. The Communist does not do this; for he holds that matter is not static but dynamic. He points out that the history of this world, and indeed of the universe, begins with lifeless matter. But this matter is not entirely inert, inasmuch as the atoms are in a state of dialectical tension and therefore possess within themselves the necessary potential dynamic to bring about further development. Thus, in the course of time we find appearing more and more complex types of matter, until finally there emerges life. The simplest forms of living matter gradually give rise by dialectical tension and development to more and more complex types with the gradual appearance and emergence of nerve centres and finally of mind. Thus, we reach a stage of fully developed mind in the higher animals and ultimately in Man.

Now, according to the dialectical principle each stage in this development represents a synthesis of a thesis and antithesis existing in the previous stage; but no synthesis is fully explicable in terms of the thesis and antithesis alone, since each synthesis adds something new to what has gone before. Therefore, no development can be fully foretold or explained in terms of the previous stage, and so the Victorian materialists' attempt to explain the later stages entirely in terms of earlier stages is contrary to the dialectical principle.¹ The Communist is a materialist, first in the sense that he insists that matter existed before mind or spirit, thereby contradicting the essence of Hegel's philosophy; and secondly, that he insists, on account of the economic determinist element in Marxism, that every development in human history is the result not of ideas or of human thought but of purely material economic circumstances. The Christian must not oppose the materialist element in Dialectical Materialism simply on the ground that it is materialistic, for there is a form of materialism which is completely compatible with Christianity. As already mentioned, Archbishop Temple remarked that "Christianity is the most avowedly materialistic of all the great religions", for, unlike the Eastern religions, it holds, as we have already pointed out, that matter, being a creation of God, and the vehicle of His Incarnation,

¹ For a fuller exposition of this point, see Joseph Needham, *Integrative Levels*, republished in *Time, the Refreshing River* (Allen & Unwin, 1943).

is good and real; and therefore the Christian would agree with the Marxist against the Eastern religions which hold that matter is either evil or illusory or unimportant. The objection from the Christian point of view to Marx's materialism is, first, that it refuses to face the question of the origin of matter, and, secondly, that it gives an entirely materialistic interpretation of history. The Marxist simply says that matter existed before spirit; but if he is asked what brought matter into existence he refuses to answer the question on the ground that it is a frivolous metaphysical question on which we should not waste our time. In fact, in Marx's own day the universe was believed to be eternal, i.e. to have had no beginning; but the majority of modern astronomers hold, as we have already seen, that such a view is incompatible with the Second Law of Thermodynamics and the principle of Entropy, and thus the Marxist materialism is now discredited even on scientific grounds. It is also, of course, unacceptable to Christians since it denies the doctrine of Creation.

Secondly, Marxist materialism is unacceptable, because it implies that man cannot exercise any control over his own destiny and that what he imagines to be his ethical principles, ideals and religious ideas are inevitably forced upon him as the by-product of the particular economic conditions under which he lives. Thus, Marxism leads to a complete denial of all ethical standards and all religious ideas; and in fact it is self-contradictory, for if it is true that the ideas which we hold are not arrived at by means of our reason, as we suppose, but are in fact forced upon us by the inexorable pressure of our economic environment, then Marx' and Engels' and Lenin's own ideas were forced upon them in a similar way and they have no right to suggest that these are any more true or reliable than any other ideas. The Communist method of escape from this dilemma is again a typically Jewish one, namely, to claim that Marx, Engels, Lenin and Stalin were chosen prophets who have been enlightened by direct revelation and thereby enabled to escape from this economic determinism—though the Communists would not put it like this. They maintain that the Marxists are the only people who have understood the true significance and processes of history and economics, though *why* they should have done so when nobody else is able to do it has never been explained.

In this connection a fourth fact might be added to the three

points noted above in which Marx betrayed his Jewish ancestry. The Jews regarded themselves as the chosen people of God, and in New Testament times, as we know, this caused them to feel an intellectual and spiritual superiority towards other nations and to regard themselves as the nation destined to lead the world and bring it to the light. It is interesting to observe that precisely the same feeling is to be seen among the Russian people in Russian history, as has been pointed out by Professor Toynbee¹; and this explains why Lenin and Stalin have unconsciously believed that "Mother Russia" is once again to lead the world to truth and salvation in Marxism, as she earlier led the East to Christianity. The Communists claim that they alone know the truth and understand the fundamental dialectical processes of history and nature, and therefore it is their destiny to lead mankind to knowledge, and to salvation in the classless society.

Since this attitude is allied to a philosophy of economic determinism, according to which it is impossible to say that one form of conduct is right and another wrong, or that there is any objective standard of ethics or morals, all such imagined standards being simply the inevitable products of economic conditions, it follows that for the Communist the only possible standard of right and wrong in regard to any action is whether or not it seems likely to bring nearer the classless society. No form of falsehood, perfidy, cruelty or ruthlessness is wrong if it is necessary for the more rapid achievement of the classless society. Thus, Communism in fact results, as does Logical Positivism, in the rejection of all religion, all ethics and all metaphysics, and must inevitably lead to a complete distrust of the human reason, since any claim to have reached a conclusion by means of a rational process of thought or argument can be denied by saying that the conclusion is in fact determined by the economic environment of the thinker. So Marx, in his Preface to *A Contribution to the Critique of Political Economy*, wrote: "The mode of production of the material means of life determines in general the social, political and intellectual processes of life. It is not the consciousness of human beings that determines their existence, but conversely it is their social existence that determines their consciousness."

Marx also held that the whole course of history is inevitably

¹ A. J. Toynbee, *Civilization on Trial*, chapter 9 (Oxford University Press, 1948).

determined, since it is the inescapable consequence of the working out of the dialectical law; and the emergence of the classless society is therefore itself inevitable. It is impossible for us to alter or change the course of history. What will be, will be. But the Communist, being the only person who understands what is happening in history, is in a position to work *with* the process and thereby bring about the classless society more quickly than it would otherwise occur.

Two other points in the Communist philosophy may be mentioned. The first is really the conclusion of the dialectical idea and is expressed by the Communists in the phrase, "the negation of the negation". The negative antithesis to the positive thesis is itself negated in a positive and constructive way by the synthesis, and this process is regarded and spoken of with almost mystical fervour by Communist writers. The other important point is the Communist doctrine of the unity of thought and action. The Communists insist that it is impossible to separate these two things. They argue that no thought is of any value unless it is accompanied by and expressed in action, and no action is effective unless it is accompanied by clear thought on dialectical materialist principles. Only by practising the Marxist doctrine can we hope to understand it; only by the light of the doctrine can we do what is needful. For this reason it is held by Communists that nobody who is not a practising Communist, and a member of the Party, can really understand Communism, nor can anyone practice real Communism without accepting Dialectical Materialism. This insistence on the unity of thought and action and the need to accompany thought by action is in no way contrary to the teaching of Christ. On the other hand, all through the New Testament there runs the idea that "by their fruits ye shall know them", and that thought or intellectual belief divorced from life and action is barren, as St. James emphasizes in his Epistle, while, as St. Paul points out, action divorced from faith is also barren. Certainly their doctrine of the unity of thought and action has resulted in extraordinary enthusiasm and devotion to their own ideal, however mistaken this may be, on the part of the majority of Communists.

The Christian objections to Communism may be summarized thus: (1) The Communist is led to deny God because he believes that all religious ideas are the by-products of

economic conditions and have no reality, and also because he regards religion as an "opiate" which retards social reform and drugs the social conscience, assisting the forces of reaction and conservatism.¹ (2) The Communist holds that the end, i.e. the classless society, justifies any means, and that apart from this single end there is no such thing as right or wrong. (3) By his insistence on social consciousness and on the need to subordinate the individual to the evolution of the species and the achievement of the classless society in the future, together with his denial of all such ethical principles as justice and freedom, the Communist is led to an intense form of totalitarianism and to the idea that the only thing that matters is the Party, denying entirely the reality of man's freedom or moral responsibility, because man is the slave of economic conditions. (4) Since Communism rejects belief in the authority and reliability of the human reason, the Communist is led to insist upon a rigid orthodoxy, an unquestioning adherence to the views of the enlightened prophets, Marx, Engels, Lenin and Stalin. For the same reason his creed leads to a repression of individual freedom in music and art and even in science, in all of which the arbiter is the Party. (Cf. the Lysenko controversy.) (5) Finally, the Communist holds that the classless society can only be reached by a dialectical process dependent upon class struggle and revolution, and in order to bring about a state of unrest and revolution he deliberately seeks to foster class hatred and war.

On the scientific side Communists maintain that Dialectical Materialism is the only truly scientific philosophy and the only philosophy for a scientific age. It is perfectly true that the dialectical principle is entirely in harmony with the facts of science and does indeed shed light upon the workings of nature, so long as it is not pressed too hard or too rigidly. Marxist materialism also is scientific, and its dialectical or evolutionary character makes it far more in accord with modern scientific ideas than the old static materialism of some 19th-century scientists. Science is based upon a philosophy which can certainly be called "realist", i.e. it takes for granted the objective reality of existence and the material world. In spite of the suggestions of Eddington and others, that modern physics requires an idealistic philosophy, such

¹ But note that it was Charles Kingsley, not Marx, who first described conventional religion (i.e. false Christianity) as "the opiate of the people".

a point of view is not accepted by most scientists and certainly is not that which tacitly underlies scientific thinking and method. The materialist philosophy of Marxism has affinities with scientific ideas and practice. In a sense Dialectical Materialism is indeed a scientific philosophy, but none the less it is open to grave objections on the scientific side.

We have already pointed out that its doctrine of economic determinism logically implies that the ideas and theories of scientists are at least coloured, if not completely determined, by the economic conditions under which they live. They cannot, either by the use of their reason, or by experience and reasoning based upon it, hope to reach reliable or accurate conclusions. Because it is anti-rational, this element of economic determinism in Marxist philosophy renders it unsuitable as a scientific philosophy. Again, the emphasis on economic conditions and processes which is inherent in the political and economic side of Marxism leads to the main emphasis in scientific work being placed upon technology and the practical applications of scientific research. The Marxists quite naturally conclude that scientific research is not to be undertaken for the sake of acquiring knowledge or seeking truth, but only for the sake of its practical usefulness. Therefore in a Communist state scientific research is carefully planned by those in control, i.e. the Party government, and scientists are only allowed to work on such problems as are dictated to them by the authorities. They must moreover work in groups under strict supervision and control.

In answer to objections to this system, the Communists reply quite truly that inevitably a similar state tends to exist under capitalism in industry, where industrial scientists must carry out research on problems dictated to them by the managers or directors of the company, rather than on what they themselves wish to investigate, and that these managers or directors will consider primarily the financial and profit-making aspect of the work rather than its scientific value or its utility to the community. On the other hand, many large modern industrial concerns have recognized that the most valuable discoveries in science, even from the financial point of view, have often been the fruits of pure research undertaken without any consideration of financial or practical results. Again, it is true that the character of modern scientific research does inevitably emphasize the need for groups of research workers working together; but there

is a great difference between a group of research workers voluntarily collaborating and a group rigidly controlled by party overseers. Again, the Marxists point out that to carry out research in science and acquire new knowledge without considering its application or the social responsibility of the scientists for the use made of their discoveries is wrong. It is quite true that scientists cannot disown all social responsibility, and that they should be in their private capacities insistent upon the community's recognizing its moral obligation to make a right and constructive rather than an evil and destructive use of the results of scientific research. But this again is very different from saying that scientific research can only be undertaken with a view to its practical results and applications. The denial of freedom to a research worker, and the denial of the value of knowledge for its own sake or of the possibility of reaching truth, are fatal to the spirit of scientific research. It seems inevitable that if science is degraded to the level of technology and its sole function is considered to be the devising of processes for the material advantage of mankind, a great part of the spring of scientific enthusiasm and inspiration will be destroyed. In a Communist state it is likely that, while technical and engineering work might thrive, pure scientific research would wither and die.

Finally, the attitude of Marxist philosophy to nature itself is very different from that of the Christian or of those scientific pioneers who laid the foundations of modern science in the 17th century. The latter regarded nature as something that is valuable and important in itself, something sacred and precious because it is the work of the divine Creator and something that must not be treated contemptuously or selfishly by man. To the Communist, on the other hand, nature is the product of purely material forces and has no rights or value in itself. It is not to be treated with respect but with ruthlessness. According to the Marxist, the sole object of science is first to understand and then to master nature and natural processes, in order that they may be controlled and bent into the service of the material welfare of mankind. Such a point of view is blatantly and callously selfish and materialistic, and again seems likely to destroy that spirit of careful and loving observation which is so essential in science, particularly in the biological field. The purely utilitarian attitude of Marxism is equally unacceptable to the research scientist and to the Christian.

Yet in conclusion we must recognize the great contribution made to thought by Marx and his followers in the clear enunciation of the dialectical principle both in history and in nature; in the sphere of social justice by their insistence on the injustice and inefficiency of 19th-century capitalism, and the futility of conventional and academic economics; and finally by their emphasis on the unity of thought and action and the barrenness of intellectual speculation which does not express itself in life or conduct.

APPENDIX C

EXISTENTIALISM

THE third new philosophy which is associated with modern science, although it is in origin a protest against it, is Existentialism. The real founder of Existentialism is Kierkegaard (1813-55), a Danish Lutheran, who was of penetrating intellect and insight but of a highly emotional and unstable character. He underwent a sudden conversion at the age of 25 and was in extreme opposition to the liberal and rationalizing theology and Hegelian philosophy of his time. He published a number of works, almost all of them under assumed names. In these he rejects the authority of reason and logic and, like the Dialectical Materialists, but in a very different way, exalts paradox and contradiction as an essential form of truth. Having committed himself to the Christian faith by an act of deep and anguishing sacrifice, he insisted that decision is of central importance and must be made with deep sincerity and earnestness. The vital situations of life have the character of Either/Or, and this experience is in itself indescribable. True choice must be a free and spontaneous act of self-committal, "a leap over the abyss", entailing both despair and repentance, a complete break with the past and a new beginning. Such experience brings realization of life, with a full sense of responsibility, and the power to accept it. To know truth one must make it a part of one's life; it comes from within. Kierkegaard held that it is useless and blasphemous even to attempt to prove the existence of God (in which he is followed by modern German theologians such as Karl Barth) and nothing can be learnt of Christ through the study of history. He is the "Divine Invader" and can be known only by faith. These essential points in Kierkegaard's teaching became the foundation of Christian Existentialism. It was in one of his latest works, *Concluding Unscientific Postscript to the Philosophical Fragments*, that he most clearly enunciated his Existentialist principles. This book is partly a rejection or criticism of the philosophy of the German thinker, Lessing; but it is also, as

its very title suggests, a protest against and rejection of the point of view of modern science and an exposition of the importance of subjectivity. Kierkegaard sought to vindicate the importance of personality and personal experience against the mechanistic tendencies of the science of his time.

The ideas of Kierkegaard were entirely ignored in his own day, and it was only in the 20th century that they began to exercise an important influence on philosophy and an almost dominating influence on theology. The Existentialist philosophers, of whom the most important are Heidegger and Jaspers in Germany and Sartre and Gabriel Marcel in France, adopted Existentialism as the title of their school because they all agreed in the central doctrine that "Existenz" precedes Essence. This doctrine is a direct reversal of the usual and classical doctrine of metaphysics, which was dominant especially in the system of St. Thomas Aquinas, but also in that of most philosophers until the time of Kant. The "essence" of a thing is its essential character, that which makes it what it is and distinguishes it from other objects. St. Thomas held that all objects were made up of substance and accidents. The accidents of an object are those things which may vary without affecting the essential quality of the object. For example, a table may be round or square or rectangular. It may be light or dark in colour, its height and size may vary; but these things are all of minor importance and no variation in them prevents a table from being a table. That which makes it a table is its "table-ness". The substance of the table is precisely this necessary quality of "table-ness", and all its other characteristics are non-essential and accidental.

If we consider a horse, we may notice that it is brown, that its height is so much, its length so much, that it has eyes of a certain colour and that its ears are a certain shape; and yet all these things may be true and still the animal in question may not be a horse. It may, for example, be a mule or a donkey. That which makes it a horse is none of these accidental things, but its "horse-ness"—that "essence of horse" which is present in it. Thus, we arrive at the conclusion that all objects have both essence and existence. The horse exists, but the fact that it exists does not make it a horse. It is its essence which makes it a horse. This "horse-ness" must be present in every horse. It existed before all the particular horses now living were born. In fact, if we adopt a

platonic point of view we might say that the proto-type of horse or the essence of horse-ness is something which exists as an ideal or idea in the Mind of God, or in the world of Perfect Forms. From the moment that a horse comes into existence, it possesses this essence and nothing that happens to an individual horse can affect its "essence of horse".

Now it is against this doctrine that the Existentialists protest. They believe that essence is not something, outside an individual object or animal, which is eternal or permanent: they believe that the essence of each particular being is built up through the life of that being and, in fact, its essence, i.e. its essential and vital character, may not emerge until the very end of its life, even if then. A man comes into existence when he is born, but he has no "essential character" as yet, only possibilities and potentialities. He must *develop* his essence, his essential character, in the course of his life; and this can only be done through the making of decisions or choices. Some Existentialists hold that there is no such thing as essence. All of them believe that existence is important and essence much less so. It was part of the idea of essence in the older philosophies that in its completeness or perfection it was known only to God. What we perceive about a table, for example, is primarily its existence rather than its essence. Kant, the great 18th-century German philosopher, denied that we can know essence at all, since he held that we can only know what we perceive or sense, i.e. a phenomenon. The thing in itself, which he called the Noumenon, is unknowable. A school of German philosophers, founded by Husserl (1859-1938), called Phenomenologists, hold that we must be concerned with what we perceive, i.e. with phenomena or things, as they appear, and with the study of the general patterns of consciousness and experience, rather than with any attempt to reach and define reality in itself apart from the data of perception. Heidegger (born 1899), who is generally regarded as the founder of the Existentialist school, was a disciple of Husserl and applied the method of Phenomenology to the examination of human existence, and the meaning of being. Whether the distinction between existence and essence is valid at all has been questioned in modern philosophy, though it must be recognized that there is some characteristic of a general nature (a "universal") which enables us to classify objects differing in obvious appearance as members of the same class or species.

The word "Existenz" has, however, another meaning for the Existentialists. They speak of existence in contradistinction to life, and they use the word in exactly the opposite way to that in which it is usually employed. We habitually say of a person living a dull and uneventful life, "He does not really live—he merely exists." The Existentialists would put it precisely the other way round, and say, "He does not really exist—he merely lives." Existence means to them a full, real, self-conscious, developing form of life, and they hold that some people can go through life without ever experiencing existence. Such people live a life purely on the level of calm, abstract, intellectual thought, of undisturbed and uneventful placidity, in which they never take any personal decision or perform any vital and anguishing action, and for this reason their character never develops—that is to say, they never come to have any essence in the true sense.

The Existentialist is primarily concerned with Man. It is man who knows, and things only "exist" when man knows them. The material world is potential or probable, but only truly and fully exists when it is known and experienced by man. In this sense also man makes his own essence. "Man is nothing else but what he makes himself." (Jean-Paul Sartre.)¹ That is the first principle of Existentialism. If we live existentially we cease to drift through life as the slaves of circumstance or convention: we choose. Choice is crucial in life. But true choice is no idle decision. We must choose with sincerity and fundamental earnestness, and with our whole being, committing ourselves entirely in the act of choice. Life confronts us with crises. We must meet them not by running away from them, or by refusing to make a choice because committal is dangerous; but we must with all our strength and being make our decision, and it is in the making of the decision which, if it is genuine, will inevitably cause us "Angst" or anguish, that we really experience reality at its deepest. It is useless to expect to find reality or truth through calm, unbiased speculation or investigation. It is only through existential action and thinking that we can come in contact with reality. We become true human beings and our true selves only through action and choice. "Man

¹ "Man first of all exists, encounters himself, surges up in the world—and defines himself afterwards . . . to begin with he is nothing. He will not be anything until later and then he will be what he makes of himself." J. P. Sartre, trans. P. Mairet, *Existentialism and Humanism*, p. 28 (Methuen, 1948).

is nothing else but what he proposes, he exists only in so far as he realizes himself, he is therefore nothing else but the sum of his actions, nothing else but what his life is."¹ An Existentialist insists that we are free. We may be conditioned and limited by our surroundings; but we are always free to choose our attitude to any given situation, and by making a free choice of attitude towards our environment we are liberated from it, we become unconditioned. If we ask on what basis or according to what principles or standard we are to choose, the answer is that we can expect no help or guidance. We must choose in the dark. There is no security. We are forced to rely upon our own individual decision. It is this that gives to the choice the element of anguish. In making our own choice, we are making standards not only for ourselves but for all men. By making a particular choice we affirm the value of what we choose. All positive and real choice is choice for the better, and what is better for us is better for all. Moreover, we have absolute responsibility. In so far as we take up an attitude or make a decision in regard to anything whatever, we are responsible for it. All situations engage us and all choices commit us. Commitment involves action, so that Existentialism is an ethic of action and self-commitment. We cannot expect assistance in our decision from abstract intellect or reason. We must make our decision spontaneously and intuitively.

Thus, Existentialism is an intensely subjective, and in that sense anti-scientific, philosophy. It insists on the value of personality, personal decision, personal responsibility, and regards everything that is impersonal as completely unimportant. This emphasis on the supreme uniqueness and value of the personal is a great protest against the tendency of modern science and modern technological and economic conditions to "depersonalize" mankind and to subjugate persons to machinery. All real experience is on the personal level and is an experience of a real person in contact with a real person—the "I-Thou" relationship. Martin Buber, who, though not an Existentialist, is a Jewish philosopher who has affinities with the Existentialists, points out that it is possible to have contact with another human being on two levels—a purely superficial level where we discuss practical affairs with no real meeting of our personalities, and the true level on which the two personalities are in direct contact. Jaspers

¹ *Ibid.* p. 41.

(born 1883), a German Existentialist, pointed out that this was the trouble with the Phenomenologists. They merely observed existence from outside as spectators; but one cannot fully know the truth until one has committed oneself to personal and existential living. Jaspers and the French Existentialist, Gabriel Marcel, are both professed Roman Catholics. Sartre is an equally professed atheist Existentialist. Heidegger is generally regarded as an atheist Existentialist, but he has recently vehemently denied that his philosophy is atheistic. It is Sartre above all who has popularised Existentialism, particularly in France, through his novels and his plays, and Marcel is also a distinguished dramatist. Kierkegaard, Jaspers and Marcel all insist that decisions can be guided by Christian principles or rather by Christian faith and intuition. Sartre, on the other hand, rejects all belief in the existence of God and therefore insists that a man is entirely alone and has no guide or help of any sort in making his decisions. Sartre ultimately comes to the conclusion that everything is absurd, including life itself. Being is without reason, without cause and without necessity. Choice is fundamental and the refusal to choose is itself a choice; and yet there is no basis on which to choose. All is absurd. We should act without hope, relying only upon our wills, which is what Sartre calls "despair". Yet in spite of the fact that the situation of man is so hopeless, suicide is no answer, for man's greatness consists in revolt against the absurdity of the world. What man needs is to find himself again and to understand that nothing can save him from himself. He is abandoned, for God does not exist, and it is necessary to draw the conclusions of his absence right to the end. Sartre's Existentialism is obviously unacceptable to any Christian; but Marcel and Jaspers show that existentialist ideas need not be anti-Christian.

Existentialism is an exceedingly difficult philosophy to explain or summarize, because it is essentially emotional and intuitive in character, rather than logical or intellectual. The key to Existentialism is in the cardinal terms of the philosophy; but these cannot be defined logically or rationally. Their content is primarily emotional or intuitive. They can only be understood in experience and action. Consequently, to attempt to explain Existentialism in intellectual or abstract language is really paradoxical.

The reason why we have made this futile attempt here is

because Existentialism represents an extreme reaction to certain tendencies in modern science and is in some ways the antithesis both of Logical Positivism and of Dialectical Materialism. But all these three philosophies agree in either discrediting or restricting the reliability and value of human reason.¹ In this they are supported by psycho-analysis and by other forms of mechanistic or behaviouristic psychology and physiology, which attempt to explain all thought as the inevitable reaction and by-product of physical and chemical processes. It is a strange contradiction that the ultimate effect of modern science, which is itself based upon trust in human reason and the idea that the human mind can distinguish between truth and error and can grasp reality, has been the production of philosophies which belittle that very human reason upon which science is based. Inevitably in decrying human reason they tend to discredit also ethical and religious principles, and ultimately destroy all hope of agreement, understanding and peace among mankind. For if impartial and rational discussion is "meaningless", impossible or futile, and no absolute standards of truth, honesty or moral obligation are recognized, what chance is there of settling issues save by force? Such a conclusion, inherent in or implied by all the philosophies we have mentioned, seems completely unjustified as a deduction from the facts and principles of modern science, and is utterly alien to the spirit of scientific research. What is needed is the restoration of a constructive rational philosophy which is the natural concomitant of science and which can only be built on the basis of the Christian faith.

Yet it would be a mistake to imagine that Existentialism has no virtues, just as we saw that it would be a mistake to think this of Logical Positivism or Dialectical Materialism. Each of these philosophies is an extreme reaction to some defect in previous philosophies. The extreme abstraction and rationality of liberal philosophy in the 18th century resulted in the development of philosophical systems which were purely speculative and completely divorced from all practical action. Similarly, the concern of liberal theology, particularly in Germany, in the 19th century with the minutiae of New Testament criticism, and its concentration

¹ It must, however, be added that both Jaspers and Heidegger have insisted on the importance of reason, so long as it is allied to action and to the whole of the human personality, and is not impersonal or objective.

upon destructive forms of "higher criticism", led to a loss of faith, or at any rate of personal committal, among Christians, and certainly merited the protest made against it by Kierkegaard. It cannot be doubted that by his insistence on the need for personal faith, decision and complete committal, in contrast to abstract reasoning and speculation, Kierkegaard performed an invaluable service to Christian thought in the 19th century. There is much in Existentialist philosophy which must command our respect. Its emphasis on the need for action and decision, the recognition that human character can only grow, and true life only be experienced, in action and through decision with the whole being, is profoundly true; and its insistence on the value and supremacy of personality and the personal is both necessary and salutary. Existentialism achieved its vogue in France among the members of the Resistance Movement during the German occupation; and who can doubt that the idea that one *must* make the decision one felt to be right, no matter how much anguish it involved or how great was the cost, brought inspiration to those brave men and women who sacrificed all in defence of the liberty of their country? When Existentialism is associated with Christianity, the negative and pessimistic, even nihilistic, character of atheist Existentialism is removed, and it is safeguarded from its own excesses. In the sphere of Christian thought and action on the continent of Europe there can be little question that Existentialism has on the whole been a very important influence in recent years¹; but in so far as it has led to neglect of the world of nature, to a denial of the importance of God's creation and of the reliability of calm human reason, it has produced unfortunate results. As was pointed out in the Introduction, there is no doubt that this tendency in modern theology has widened the rift between scientists and Christian theologians. The queer tinge of pessimism, even morbidity, which was present in the character of Kierkegaard himself, has left a deep mark on Existentialist philosophy which needs to be purged away by the realization of the joyous element in the Christian faith—of Christ as the Light rather than the Darkness.

¹ For evidence of this, see Appendix D following.

APPENDIX D

THE PROBLEM OF THE COMMUNICATION OF THE CHRISTIAN "GOSPEL" IN A SCIENTIFIC AGE: THE ATTEMPTS OF RUDOLF BULTMANN AND KARL HEIM TO SOLVE IT

IT has been¹ pointed out in the course of this book that the language of Science and the language of Religion are necessarily different, and that it is not possible to use the same language for two entirely distinct purposes. But when this has been fully recognized there remains the problem of devising such an expression of the Christian Religion, and especially of its essential "Gospel", as will be both intelligible and meaningful, and also relevant or realistic, to a generation which has learned to think in terms of scientific or technological civilization or of secular materialism. If the Christian Faith is to make any genuine impact on contemporary society it must be set forth in such a way as to make evident the fact that it is as directly vital to the 20th century (or any other century) as it was to the 1st, and that it is not tied up with, or restricted by, the popular beliefs, superstitions or conditions of the Jews in Palestine in the days of Our Lord, or the Greek philosophy of the first five centuries. In other words, a method must be found of communicating the Gospel in terms of the needs and background of the present age, without omitting or diminishing anything that is fundamental or essential to the Gospel. This problem of communication is one of primary importance for the survival of the Christian Religion and the salvation of the world of today.

Two great German theologians have recently applied themselves to it; and since they both set out to find a presentation of the central truths of the Christian Faith in terms acceptable and intelligible to modern scientific minds, some outline of their work should be attempted here.¹

¹ A short account of Bultmann's views may be found in Ian Henderson's *Myth in the New Testament* (S.C.M. Press, 1952).

The first is Rudolf Bultmann, whose essay, *New Testament and Mythology*, was published with a number of critical essays, and answers by Bultmann to his critics, in 1948, and in an English translation in 1953.¹ The central problem, it seems to him, is created by the "mythological" elements in the New Testament. An attempt was made by the German "liberal" critics of the 19th and early 20th century to overcome this by simply eliminating or omitting every "mythological" incident or phrase from the New Testament, thus arriving at a "simple, ethical religion". But more recent recognition of the central importance of the "Kerygma", the preaching or proclamation of the Gospel, in the New Testament, with mythological elements inextricably bound up with it, has shown that this facile procedure is unsound and indeed impossible. It has become apparent that what is required is not the elimination of this mythology but its re-interpretation. But Bultmann believes that there is a great deal in the mythological or mythical framework of the New Testament which is not essential to the fundamental Christian Gospel, and that it is precisely this mythology which constitutes the great stumbling block to the acceptance of the Christian Faith by the modern man. Accordingly, Bultmann has proposed a procedure for the "demythologisation" of the New Testament "Proclamation".

He begins by pointing out that the cosmology of the New Testament is mythical in character, with its "three-storied structure", angels and demons, heaven and hell. Earth itself is the scene of contests between God and Satan, and the life of men is subjected to supernatural forces, which even in nature intervene to produce miracles. The whole universe hastens towards its end, which will come very soon and take the form of cosmic catastrophe, followed by the "woes" and judgement. It is against this background that the New Testament proclaims the "event of redemption which is the subject of its preaching", and the language and symbols in which the Gospel is presented are those of this mythology. Bultmann then says: "To this extent the 'Kerygma' is incredible to modern man, for he is convinced that the mythical view of the world is obsolete". He goes on to ask: "When we preach the Gospel today, do we expect our converts to accept not only the Gospel message, but also the mythical

¹ *Kerygma and Myth*, edited by H. W. Bartsch, translated by R. H. Fuller (S.P.C.K., 1953).

view of the world in which it is set? If not, does the New Testament embody a truth which is quite independent of its mythical setting? If it does, theology must undertake the task of stripping the Kerygma from its mythical framework, of 'demythologising' it." Where the earlier German liberal critics wished to reject the theology of the New Testament, and retain only its ethics, Bultmann wishes to retain the theology but to reject its setting.

Bultmann rightly points out that it would be both senseless and impossible to expect modern man to accept the cosmology of the Bible—it is simply that of a pre-scientific age, and "all our thinking today is shaped for good or ill by modern Science". But he admits that ancient myths often enshrine truths. He emphasizes that we cannot speak literally of a heaven "above" or a hell "beneath our feet", or believe that the stars are demons. He brushes aside any acceptance of miracles or "spirits, whether good or evil", and points out that the mythical picture of the second coming of Christ cannot be accepted in its original form, for the simple reason that this imminent "parousia" never took place as the New Testament writers expected. Moreover, modern psychology has disposed of the idea of daemonic possession. Also, says Bultmann, the modern man can make nothing of sacraments or of spirit working through matter, and he is bound to reject the doctrine that death is the punishment of sin or the result of human sin; while the New Testament conception of Atonement, depending as it does on the Crucifixion of the pre-existent, sinless, incarnate Son of God, as a victim who bears vicariously the sin of the world, whose blood atones for our sins, and who, by enduring punishment for them, delivers us from death, is abhorrent to him. Finally, the Resurrection of Jesus, at least as a miracle by which spiritual power is made available to men, or "an event of past history with an evident meaning", or as a miraculous proof of the significance of the Cross, is absurd. "This mythological interpretation is a hotch-potch of sacrificial and juridical analogies which have ceased to be tenable for us today."

This, in outline, is the mythological element which Bultmann seeks to remove, in order to make the Gospel real and comprehensible to the modern scientific man. But he insists that we cannot preserve the Gospel by selecting some of its features, and subtracting others, to reduce the amount of mythology in it: it must be "demythologised" completely.

Does this then mean that we lose the whole New Testament message; does it consist entirely of mythology? Or can it more truly be understood by the "elimination" of the mythological framework? Bultmann holds that the latter is the case.

This leads him to consider the purpose and nature of myth, which he regards as being intended not to present an "objective" picture of the real world, but rather to express man's understanding of his world. It is, he admits, "the use of imagery to express the otherworldly in terms of this world and the divine in terms of the human". But significantly he says: "Myth should be interpreted not cosmologically, but anthropologically, or, better still, existentially." "The importance of the New Testament mythology lies not in its imagery but in the understanding of existence which it enshrines. The real question is whether this understanding of existence is true. Faith claims that it is, and faith ought not to be tied down to the imagery of the New Testament mythology." Bultmann complains that the New Testament is itself contradictory in some of its mythology; much of it contains two or more ideas in dialectical tension. Particularly is this evident in the treatment of human beings sometimes as wholly under the control of cosmic beings, and sometimes as morally responsible, independent personalities.¹

Bultmann then criticizes the attempt of the German "liberal" or "modernist" theologians of the last century to eliminate the mythological element in the New Testament. He argues that they threw out not only the mythology but also the essential core of the Gospel itself. But this, he points out, has produced a strong reaction, and an acceptance of the Gospel in a naïve form. Because it is so mythological, this naïve form of the Gospel is unintelligible to the modern world. Therefore we must use biblical study and criticism to "interpret" the mythology. The 19th-century liberal critics interpreted it in terms solely of religious philosophy and ethics. But the New Testament itself speaks of an historical event through which God has redeemed man. It emphasizes not His teaching but His Person. Therefore, says Bultmann, we must reject the "liberal" interpretation; and on other grounds he dismisses other previous attempts at interpretation

¹ For a fine study of the profound spiritual significance and truth of this paradox, see D. M. Baillie, *God was in Christ* (Faber & Faber, 1948). This book also contains a summary of recent developments in German New Testament criticism and theology up to the time of Bultmann.

because they too destroy the essence of the Gospel. In their place he proposes an "existentialist" interpretation. The task of working this out will, he thinks, occupy the time and energy of a whole generation of theologians.

The central point of this interpretation must be that it interprets the mythology of the New Testament in such a way as to challenge us to a decision, "a genuine existentialist decision", as Bultmann calls it. For example, the mythology concerning "The World", the Fall, flesh and spirit, is to be understood as presenting us with a choice as to the object on which we "focus our anxiety", a decision between the pursuit of material security, property and earthly life on the one hand and the life of faith on the other, with its abandonment of security, and detachment from material things, treating the world "as if not". The life of Faith is a new life "which must be appropriated by a deliberate resolve". The typical "Existentialist" terms used here prepare us for Bultmann's statement, after a reference to Karl Jaspers and Kierkegaard, that "Heidegger's existentialist analysis of the ontological structure of being would seem to be no more than a secularized, philosophical version of the New Testament view of life". "For him the chief characteristic of man's Being in history is anxiety. Man exists in a permanent tension between the past and the future. At every moment he is confronted with an alternative. Either he must immerse himself in the concrete world of nature and thus lose his individuality, or he must abandon all security and commit himself unreservedly to the future, and thus alone achieve his authentic Being." So Bultmann is led to the conclusion that "the philosophers (i.e. the Existentialists) are saying the same thing as the New Testament". But he also points out that if, as the Existentialists say, the authentic life is one of self-commitment, then life can come only from God, for self-commitment can be received only as a gift from Him. Thus, we can advance to an existentialist interpretation of the mythology of sin, the Fall, and Grace.

This is the first example of the "demythologisation" of the New Testament into existentialist terms. Bultmann proceeds to consider against this background the reality behind the Virgin Birth, the Cross and the Resurrection of Jesus Christ. He rejects the idea of using the last as a proof of Christ's claims; for he holds that the literal resurrection, in the sense of resuscitation, is incredible. It is an article

of faith, and the Cross and Resurrection together are a "cosmic" or "eschatological" event. They are all part of the event of Redemption, wrought out in space and time. The Resurrection is not subject to proof; and "it is precisely its immunity from proof which secures the Christian proclamation against the charge of being mythological". This statement is a very strange one: it is hard to see how immunity from proof can save a statement from being called "mythological", but it is characteristic of Bultmann that he considers the objective historical facts of Our Lord's life, death and resurrection as being of little or no importance. His earlier studies on Form-Criticism of the New Testament, of which he was the most radical and extreme exponent, have not unnaturally led him to regard the historical and factual statements of the Gospels as very unreliable. But he assumes that this is of no significance, since the whole value and meaning of the Incarnation, Cross and Resurrection are in the subjective experience of the Christian, i.e. in their existential aspect. Theological rather than historical truth is the reality.

It is not surprising that this attempt of Bultmann to "demythologise" the New Testament provoked great discussion and strong opposition in Germany. In many quarters he is accused of rejecting the central facts of the Gospel narrative, such as the Resurrection and the Virgin Birth, along with miracles. But he himself claims that he is not rejecting them but only rejecting a literal interpretation of them. His definition of myth and his interpretations of Christian doctrine have been strongly challenged. The main objections to his procedure are, first, that he wishes to re-interpret Christianity in terms of a particular philosophy which is at the moment fashionable on the continent of Europe, and that he tends to reject as "mythological" anything which will not fit into this philosophical background. Secondly, this philosophy is itself unscientific and non-rational, with its emphasis on subjective and emotional experience, and its disparagement of rational proof or historical study; and a restatement of Christian Faith in terms of this philosophy is scarcely likely to be any more acceptable to the modern scientific man than the "mythological Christianity" which it is intended to replace. Thirdly, although Bultmann at one point admits that mythology can be used as a language of religion so long as it is recognized

that we are only speaking in analogy, using human terms, or rather human relationships, as analogous on their own plane to some corresponding divine relationship on the divine plane, yet in fact he never himself recognizes this interpretation as valid. He rejects the very word "ascension", for example, on the ground that it implies a journey upwards in space; yet it can surely be used analogically or metaphorically, of the exaltation of Christ into his eternal majesty and glory in heaven, as it is clearly used in various New Testament Epistles and in the Apostles' Creed. The mythology of the New Testament is of two sorts. Some is simply the mythical or superstitious background of contemporary thought, which can be discarded without touching any essential doctrine, like the belief in demons; but other parts of it are analogical or metaphorical statements of great religious truths, and once they are recognized as such they present no difficulty for science, which has itself to use mathematical or linguistic analogies for things of which no precise literal expression is possible. In addition there are great facts like the Resurrection or the Virgin Birth, which Bultmann treats as mythical, but which can more truly be regarded as historical, as we have already tried to show.

Thus, we may say that Bultmann's effort to overcome the problem of the communication of the Gospel in the present age fails, first because he re-interprets it in terms of a philosophy as difficult to understand and as unacceptable as the original mythology, and secondly, because his procedure is undoubtedly destructive of some of the essence of the Gospel, however much it may bring out certain very vital elements in it such as Faith, Grace and Self-commitment. His work is in truth a re-interpretation not so much of the New Testament, as of the teaching of Luther and Barth in existentialist terms.

But the problem of communication which he recognizes certainly remains; and a more constructive and successful attempt has been made to overcome it, by another great German Lutheran theologian, Karl Heim.

Karl Heim has a considerable knowledge of modern science—based on a close collaboration with Professor Pascual Jordan, the Quantum physicist—and displays far more understanding of and sympathy with recent scientific research than does Bultmann. But he points out the danger

that modern scientific study may lead to a view of life which is completely secularist, and in which the very language of religion may become meaningless and morality appear an illusion, so that the only reality recognized is the struggle for power and the elimination of the weak. In such a situation it is impossible for conventional religion or theology to make itself heard or understood. He insists on the need for a return on the part of theology to its former association with philosophy, and argues that its task today is primarily to present a coherent world-view, in opposition to that implied by disbelief. He holds that the vital conflict today is not between one form of Christian doctrine and another, but between Christianity itself and the prevalent secularist, materialistic view of the world. It is the paramount duty of Christians not to shirk this task or try to evade this conflict, a conflict not even between Christianity and other religions but between a religious and a non-religious view of the whole of life.¹ Heim rejects any attempt to justify Christianity from the supposed conclusions of modern science. To found one's faith on theories and tentative hypotheses is to have a very unsound basis for it. What is needed is, first, a philosophical examination from the Christian point of view of the ultimate pre-suppositions and limitations of the scientific method, as well as of the implications of modern scientific discoveries, and secondly, a restatement of the truths of the Christian faith in categories intelligible to those trained in the context of modern physical science. He emphasizes the urgent need to translate the truths of theology into terms and concepts which are real and familiar to modern scientists. He then proceeds to argue that "the rift between belief and natural science can today be bridged, and mutual comprehension established, only if it is possible to transpose the concept of *space*, which has acquired a position of primary significance in modern physics, in a higher sense to the world-picture of belief". This leads him to a lengthy and intricate philosophical discussion of fields of consciousness and structures of reality.

Heim first insists on the need for recognizing the reality of our own self-conscious Ego—the knowing subject—whose existence has to be recognized before we can attempt any science at all, "a reality which presents itself to each one of

¹ Karl Heim, *Christian Faith and Natural Science*, cf. Introduction, pp. 11-35 (S.C.M. Press, 1953)

us, including the natural scientist, even before we begin to observe, experiment and calculate. This reality is my personal ego."¹ He stresses the priority and vital importance of the Ego or Subject in knowledge and experience, and protests against its subordination to a "soulless" objectivity. He emphasizes that though the Ego is not to be identified with the body, it is yet tied inextricably to a particular point in the phenomenal world and compelled to view the world from an individual standpoint. He quotes Heidegger's phrase "being cast into one's *there*", "my *thereness*". This existentialist idea of unavoidable appointment to a station in existence, obviously akin to certain aspects of the Calvinistic doctrine of predestination, is an essential element in Heim's argument. He then insists on the reality of the human experience of the encounter between the "I" and the "Thou", which introduces us to a "non-objective" region which, though manifestly real, lies beyond the reach of scientific methods of study (here again he has many points of contact with Existentialism). There are "two realities", he points out, "which we cannot observe objectively and which are consequently beyond the range of scientific investigation, the cognitive and volitional 'I' and the cognitive and volitional 'Thou'."² He then turns to consider the "It", the objective world towards which all the work of natural science is directed. He first puts forward the possibility that the entire world is animate, which suggests that the objective world, which in science we investigate experimentally, is not the whole of reality but is only one space or level or medium of existence. There exists simultaneously a second, non-objective space, in which the "I" and "Thou" of animate beings encounter one another. He pursues this idea of different spaces in the light of modern physical concepts of non-Euclidian geometries, and points out that whereas we can *calculate* with multi-dimensional spaces, we cannot *conceive* them intuitively as we can Euclidian space. It is thus possible for us to be situated in a space without being aware of it, and it is also possible that there may exist physical beings which live in a space-pattern that is completely inaccessible to us. His survey of human experience and the various types of "space" (i.e. of frames of existence or fields of consciousness) leads on to a recognition that in

¹ Karl Heim, *op. cit.* pp. 35-71.

² *Ibid.* p. 71.

all these—whether the objective space of physical science or the “non-objective” “space” of human encounter—we come in the end up against a “polarity” (a concept recognized by modern physics), an irreconcilable dialectical tension between two conflicting elements, typified in the Eastern concept of Yin and Yang and similar to the Dialectic of Marxist philosophy, which either frustrates all decision or renders it purely arbitrary. Thus he shows the necessity for some reality, some frame of experience or “space”, beyond all the various types of “polar space”, a final reconciliation and synthesis of all the dialectical tensions and partial conflicting knowledge of other “spaces”, objective or subjective; and the recognition that Christians do in fact have experience of such a “supra-polar” “space” enables him to show that the third great reality which lies beyond the reach of scientific investigation is God, whom we know through the framework of “supra-polar” space. God is neither to be deduced from the observation of natural phenomena, nor is He, like the subjective human “I”, a demonstrable fact of human “polar” experience.¹ He exists neither in objective space nor in subjective space. In a previous volume, *God Transcendent*, Heim had asserted that any attempt to prove, or even to argue for, the existence of God from the natural world was fore-doomed to failure. It is characteristic of all the theologians of the Barthian school that they reject the idea and possibility of what is usually called “Natural Theology”. That is to say, they will not admit that the existence of God can be deduced, or even inferred as a reasonable possibility, from the works of His creation, or from the phenomena of nature, by any philosophical arguments.² In his present works Heim argues that his conception of supra-polar space renders any such attempt impossible. He says: “The supra-polar space is indeed the space in which God is present for us. (But) if the space of God is reduced to a common denominator with the space of the world, is that not a Titanic attempt by human thought to make itself master of God and to enmesh Him, who is after all ‘the wholly other’, in the net of our human concepts and categories? Does that not lead us to the apologetic method which arose from the principle of the ‘analogue

¹ *Ibid.*, pp. 71–202.

² For a recent defence of Natural Theology, see J. V. Langmead Casserley, *Graceful Reason* (Longmans, 1954).

entis', that is to say, from the idea that God is and the world also is, so that both fall within the same concept of being, from which it follows that from the being of the created world, which is after all a reflection of the Creator, the being of the Creator may be inferred? The answer to this objection must be that precisely the opposite is the case. The idea that God is present for us in the supra-polar space is precisely the means of invalidating the proposition of the 'analogia entis'. Indeed it is the only effective bulwark capable of warding off the peril with which our religious life is threatened by that seductive proposition, the 'analogia entis', which at first sight appears so extraordinarily convincing."¹

The reason for his vehement objection to any effort to deduce the existence or nature of God from the existence or nature of the world is made very clear by Heim in his earlier book, *God Transcendent*.² There he writes: "When we ask about the Creator, we have in so doing passed beyond all possibilities of human knowledge. The question could never even arise in our mind by our own evocation: it comes by the act of the Creator Himself."³ He goes on to quote St. Paul's statement, "The invisible things of God from the creation of the world are clearly seen, being understood by the things that are made"; and continues: "Paul did not mean by this a causal inference from the events of the world to a First Mover. On the contrary, to express our religious sense of the unseen Creator Who stands behind creation, he prefers the term *νοεῖν*, the word used by Plato when he describes how, led by such a religious sense, we penetrate the veil of changing appearances and arrive at the eternal Ideas, of which things perceived by the bodily senses are impure reflections."⁴ He then concludes: "So long as we rest content with the naïve interpretation of the idea of God, we believe ourselves able to discover, by the simple method of empirical inference, the nature and the will of the God Whom we have ourselves fashioned to suit our own practical needs. This 'Creator' is the starting point of the causal series we know, the chosen principle from which all the values and institutions we care for can be stabilized. So all we need to do is to travel back within this series in order to discover what God's will is. But this fabric of inference we have devised for ourselves collapses

¹ *Ibid.* pp. 163, 164.

² Karl Heim, *God Transcendent*, p. 135 (Nisbet, 1935).

³ *Ibid.* p. 195. See also *Christian Faith and Natural Science*, pp. 162-164.

⁴ *Ibid.* p. 224.

in a moment, like a house of cards, as soon as the ultimate question really dawns upon us and we find ourselves violently thrown out of our secular interpretation of religion. All our lights go out, and we are plunged there and then into utter darkness. We stand before One Who is not to be reached directly by any inference from given reality. We stand before the 'Unknown God'." "Paul", says Heim, "was come to bear witness concerning a Leader, Who could show the way, as none other than He could, to this Great Unknown".¹ Thus, he expresses the fundamental standpoint of all the Barthian theologians, that the foundation of faith is not in "fallen" human reason or its deductions from the natural world, but only in the divine revelation of the Word of God.

We may feel in the case of Karl Heim, as in that of Bultmann, that the Barthian theology is hardly likely to be the interpretation of Christian doctrine which is most congenial to the scientific mind; but we must recognize that Heim has made a far more fundamental effort than Bultmann to grapple with the problem of the communication of Christian theology to those trained in the method and thought of modern science. For his exposition of Christian doctrine in categories derived from modern physical ideas of space and non-Euclidean geometries is a real attempt to express theological truths in a "language" which is intelligible and relevant to the physical scientist, though we may question whether his use of the concept of space is altogether legitimate or will commend itself to a mathematician or physicist.

In his most recent book Heim has extended his efforts to present Christian teaching in the context of scientific ideas. He begins from the question, What do we mean by God? He quotes Pascual Jordan as saying: "In the outlook of modern man there is only one spiritual phenomenon characteristic of our age and at the same time of unqualified magnitude and power. Our epoch has found the authentic symbol of its inner struggle in the researches of modern science."² He then asks, What is the bearing of the transformation of the scientific view of the world, with which we are confronted today, on the question about God?

Heim points out that the usual answer to this query is that the breakdown of the causal-mechanical conception of New-

¹ *Ibid.* p. 225.

² Karl Heim, *The Transformation of the Scientific World View*, translated by W. A. Whitehouse, pp. 16, 17 (S.C.M. Press, 1953).

tonian physics has made it possible again to approach God by way of nature, from the created world to its Creator. This, since it suggests a revival of "Natural Theology", Heim of course rejects, for the reasons given above. He finds the true significance of modern physical concepts in a different consequence. He argues that to believe in *any* "Absolute" is to set up an idol alongside God, and to detract from the "Absoluteness" of God and from His Sovereignty. This is true in natural science as in philosophy. But Newtonian Science had set up three such Absolutes—the Absolute Object, having a completely determinate structure and constitution, independent of any other object and of any observer; Absolute Space and Absolute Time; and the Absolute Determination of the world process, because it was subject to the universally valid law of causality and every event *necessarily* followed from preceding events. Heim considers these absolutes one by one, and shows how in each case the result of modern developments in physics has been to destroy the absolute. The result of the ideas of Planck and Bohr is to render untenable the idea of the atom as an Absolute object: "the world is not separable from an observing subject". The theory of Relativity has disrupted faith in Absolute Time and Absolute Space. Finally, the Uncertainty Principle of Heisenberg has overthrown the belief in causal necessity and determinism, at least in the atomic realm. Heim points out that the consequence of this last fact is to throw us into a new situation, where the entire picture of reality has been suddenly altered, and reminds us that the position of a contemporary man, contemplating the ruins of his old causal-mechanical faith, is well expressed by the Existentialism of Heidegger and Sartre, in such phrases as our being "held within the Void", involved in "dread" (Angst) and "anxiety" (Sorge), in face of an advancing threatening reality, when faith has been lost in any certainty or calculation about the Future. But Heim urges that there is another possible attitude than that of "Angst" or "Sorge", namely, Faith in God, and the words of Jesus: "Be not afraid! Be not anxious for the morrow".

Having shown how the collapse of these false Absolutes in Science has left the way open for faith in God alone and complete self-committal to Him, Heim deals with the question of Miracles, rejecting the contrast between natural and supernatural, and insisting that "they express the inner

structure of the world process. . . . Everything is miracle in so far as we experience it from within".

Finally, he turns to biology, and discusses the problem of the mechanistic or vitalistic interpretation of the process of life. He first reminds us of the necessary limitation of scientific study, since the only space which it can bring within our view is the space of objectivity, and our own inescapable existence reminds us at every moment that this is only a partial aspect of the world, and that reality has other sides of which we cannot give an objective representation. The world of objective space has not only an invisible foreground, the non-objective "I", the observer, but also an invisible background, "the inner life behind the outward show". Just as in our relationship with other men we have (1) our own imperceptible "I", (2) the medium of objective space between us, and (3) the invisible "other", so we stand in the same relationship to animals and plants, and perhaps even to molecules and atoms. Objective space is a transparent screen between us and them and we cannot portray to ourselves the inner life which lies behind the objective outward aspect, of which perhaps the "instincts" of animals and insects are the incomprehensible signs.

Passing on to the controversy between mechanism and neo-vitalism, Heim suggests that modern atomic research has undermined the whole significance of this. X-ray investigation into the structure of crystals, and crystal-lattices, as well as examination of molecular structure, has shown in both cases a very definite symmetrical configuration or pattern, which indicates a "wholeness", carrying with it the power to retain a given form and to resist the destruction of it. But such a "wholeness" is *characteristic* also of living organisms. How can we say then where dead matter ceases and organic life begins? We have, says Heim, been accustomed to insist that three functions of the living cell are absent in dead material: (1) nourishment and growth; (2) propagation; and (3) the capacity to receive and react to stimuli. But all these functions are now known to be present, in another form and on a lower level, in the elementary particles of inorganic matter. Crystals of minerals, for example, will select and assimilate certain elements from their surrounding matter and reject others. Liquid crystals are able to divide into two separate parts, which then behave as perfect individuals, and later divide again.

Crystalline particles of silver bromide react to light photons on a photographic plate. Thus it is hard to divide them from simple living organisms. Again, there are intermediate forms between living and non-living, such as viruses. Moreover, the genes of plants and animals are multi-atomic molecules, and mutations in the genes are quantum-jumps of the molecule. Thus the frontiers between the dead and living worlds dissolve away. Both "living" and "dead" matter are characterized by the same "wholeness-tendency"; the barrier which the vitalists sought to erect between them are gone, while mechanistic images are no more applicable to the "non-living" than to the "living". Finally, Heim argues that our relationship to all these "sub-human wholenesses"—animals, plants and inorganic entities—is fundamentally the same as to our fellow-men. They present to us an outward picture: their inner picture is concealed. But Heim ends by stating that "God is the terminal point of reference at which the life-lines of all His creatures intersect, and in Him all the walls which create interior separation between His creatures will be thrown down."

Heim concludes this volume of his work by promising us another, in which he proposes to examine the question of the suffering and corruption and dread which overhang the animal world, with reference to the 8th chapter of St. Paul's Epistle to the Romans. Is there hope of redemption to give meaning to life, and enable us joyfully to endure suffering, hoping for a brighter future? It will be of intense interest to read Heim's treatment of this supreme question. Meanwhile we must commend the courage and sincerity with which he has tried to bridge the gulf between the theologian and the scientist, between the standpoint of the Christian Lutheran believer and that of the modern scientist, and to present some of the profound Christian doctrines about God and Creation in terms real and intelligible to the modern scientific man. We may feel that he is, like Bultmann, handicapped in some ways by the particular type of Christian theology (Barthian Lutheranism) which he seeks to expound, and to a slight degree by the Existentialist philosophy into which he tries to fit it, though his use of Existentialism is far more judicious, constructive and convincing than Bultmann's. We may consider some of his ideas speculative and dubious. But at least these two German writers deserve credit for dealing with the whole question of the communication of the Christian Faith

in a scientific age; and Heim especially has done this in a much more profound, original and stimulating way than any of his predecessors, and has put forward many very valuable suggestions. It is impossible in a short summary such as this to do justice to the depth and sweep of his thought.

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